Photogrammetric Monitoring of Double-crested and Pelagic Cormorants Nesting Sites on Urban Bridges and Remote Seacliffs in the Salish Sea

by

Macus Ong

B.Sc. (Hons., Marine Science), National University of Malaysia, 2012

Dip. Ed., New Era College, 2015

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Declaration of Committee

Name:	**Macus Ong**
Degree:	**Master of Science (Ecological Restoration)**
Title:	**Photogrammetric Monitoring of Double-crested and Pelagic Cormorants Nesting Sites on Urban Bridges and Remote Seacliffs in the Salish Sea**
Committee:	**Ruth Joy** Supervisor and Chair Faculty, SFU
	Ken Ashley Committee Member Faculty, BCIT
	Doug Ransome Committee Member Faculty, BCIT

Abstract

Double-crested (*Phalacrocorax auritus*) and Pelagic Cormorants (*P. pelagicus*) nest colonially on cliffs and offshore islets. In the Salish Sea, a shift from natural sites to bridges has occurred. Significant cormorant colonies are nesting on Vancouver city bridges, conflicting with provincial bridge management efforts. In recent years, exclusionary measures have been implemented to keep bridges cormorant-free and more are proposed. This study investigated their nest-site selection on urban bridges and at a natural seacliff in the Salish Sea by using time-series data captured by GigaPan®, Sony, and GoPro systems from May 2020 to March 2021. Results show breeding occurred between April and August with nest-site selection dependent on central bridge structures, and on heterogeneous cliff ledges. Bridge nest site selection demonstrates a central colony preference. Nests begin to disappear (fall off) from the bridge in August, as the young fledge from the nests. These results suggest further monitoring is needed to demonstrate nest-site selection and inform cormorant management on Vancouver's bridges.

Keywords: Double-crested Cormorants; Pelagic Cormorants; photogrammetry; breeding biology; conservation biology; Vancouver bridge policy and planning

Dedication

This thesis is wholeheartedly dedicated to my beloved mother, Sung Leng Lee, for her love and whose strength has taught me to work hard and persevere for goals I aspire to achieve. I love you, mom. This research is also dedicated to my supervisor, who continually provides constant source of support and encouragement, morally, emotionally, and financially, during challenging times throughout my master's degree.

I hope that this work may contribute to the conservation of seabirds, as well as make members, who provide sound support, proud of the achievement of this academic goal.

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List of Acronyms

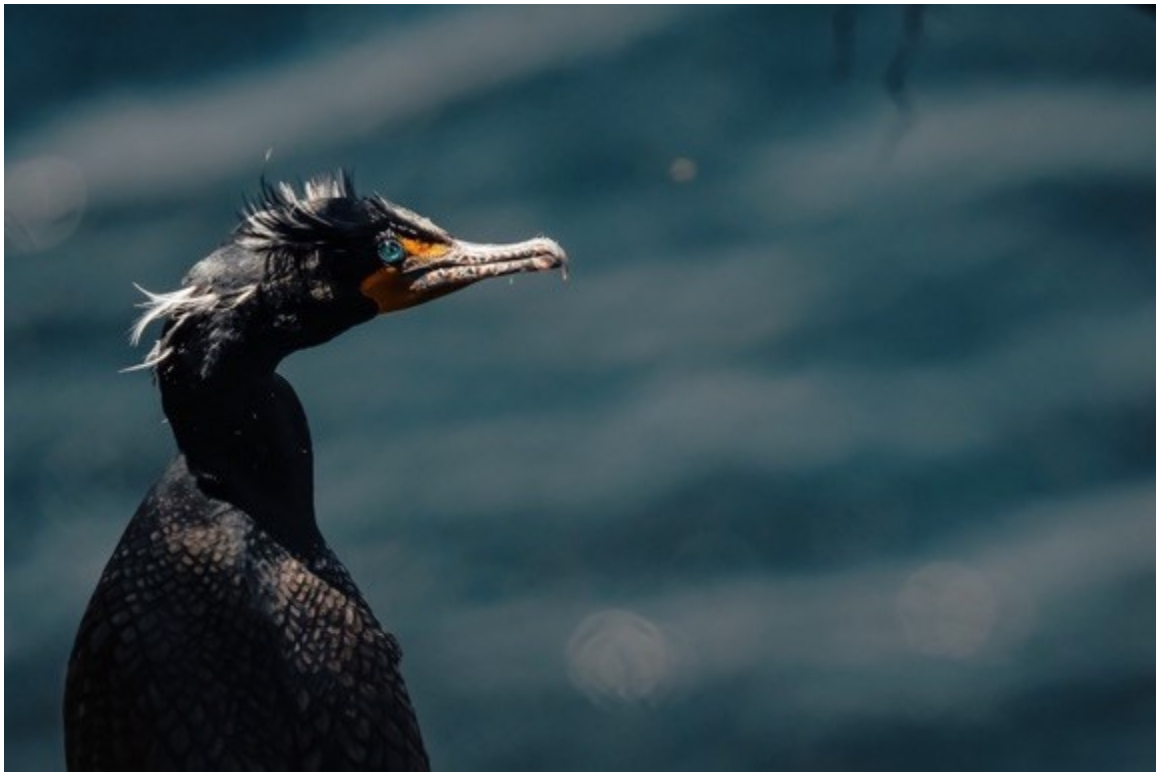
A	Ampere
A2	Application Performance Class 2
AC	Alternating current
BC	British Columbia
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COVID-19	Coronavirus disease, or severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)
CRAGS	Commonwealth Scientific and Industrial Research Organization Ruggedized Autonomous Gigapixel System
CSIRO	Commonwealth Scientific and Industrial Research Organization
CWS	Canadian Wildlife Service
DC	Direct current
DCCO	Double-crested Cormorant
DDT	Dichlorodiphenyltrichloroethane
DMF	Direct Manual Focus
DSLT	Digital Single Lens Translucent
G	Gold
GB	Gigabyte
ISO	International Organization for Standardization
IWMB	Ironworkers Memorial Bridge
JPEG	Joint Photographic Experts Group
MBTA	Migratory Bird Treaty Act of 1918
MOTI	Ministry of Transportation and Infrastructure
MP	Megapixel
NASA	National Aeronautics and Space Administration
OS	Operating system
OSS	Optical SteadyShot
PECO	Pelagic Cormorant
PhD	Doctor of Philosophy
PIT	Passive Integrated Transponders
RAM	Random Access Memory
SARA	Species at Risk Act

SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
SDXC	Secure Digital eXtended Capacity
SLC	Slim, Light, Compact
TB	Terabyte
TIFF	Tagged Image File Format
UHS	Ultra High Speed
US	United States
USFWS	United States Fish and Wildlife Service
V	Video Speed Class
V	Volt
WB	Wide angle

Glossary

A2	The Application Performance Class 2 is defined by SD Physical 6.0 specification where the memory card has higher performance than the A1 performance by using functions of Command Queuing and Cache.
FE	Lenses that cover a 35 mm sized sensor and designed to be used with Sony's full-frame mirrorless cameras.
Flange	A flat beam that is placed on top (T-shaped) or below (inverted T-shaped) a girder and functions as a load-bearing beam.
F-stop	Focal stop or the opening of a camera lens.
Girder/I-Beam	A horizontal support of a bridge structure which supports smaller beams, and often has cross section of an I. A girder often has two load-bearing beams called flanges, forming the I cross section of the structure.
Hemmera	Hemmera Envirochem Inc.
ISO	Light sensitivity on the camera sensor that maintains similar brightness levels.
Protune	Manual enhancement features and settings in GoPro cameras.

Preface Image



You cannot miss their majesty. I thought they were Pterodactyl at first, and I still do, but now, more than that — Macus Ong.

Chapter 1.

Introduction.

Cormorants (*Phalacrocorax* spp.) are a family of seabirds. Their dark plumage is radiant with green (Wires 2014; Dorr et al. 2016), especially on the head, neck, and belly. They also have elegant back feathers (Wires et al. 2001). They have 'snaky' necks and laterally compressed bills that are slightly grey and slender with a sharp hook-like tip (Dorr et al. 2016). Cormorants have beautiful emerald green and deep blue eyes. They have black totipalmate feet in which all their four toes are connected by a web (Wires 2014; Dorr et al. 2016), making them awkward on land, but an agile diver. White crests or filoplumes are developed on both sides of the breeding adults head on the Pacific Coast (Wires et al. 2001; Dunn & Alderfer 2008; Wires 2014), and above their eyes (as their Latin species name, *auritus*, suggest 'eared') (Wires et al. 2001), in their breeding plumage, and for which this feature gives them the name of Double-crested Cormorants (*P. auritus*) (Figure 1-1). Cormorants like the Double-crested Cormorants have a featherless section below their lower bills. This part of the skin develops to a gular pouch similar to that of a pelican (Dorr et al. 2016), where in many species of the cormorants, is used for storing fish while hunting for food. In breeding plumage, the inner mouth of the Double-crested Cormorant appears to be 'cobalt-blue' (Wires et al. 2001). Some immature cormorants that are aged one to two years old have pale grey or black plumage on their necks and upper bellies, while some extend to their lower bellies (Dunn & Alderfer 2008; Dorr et al. 2016).

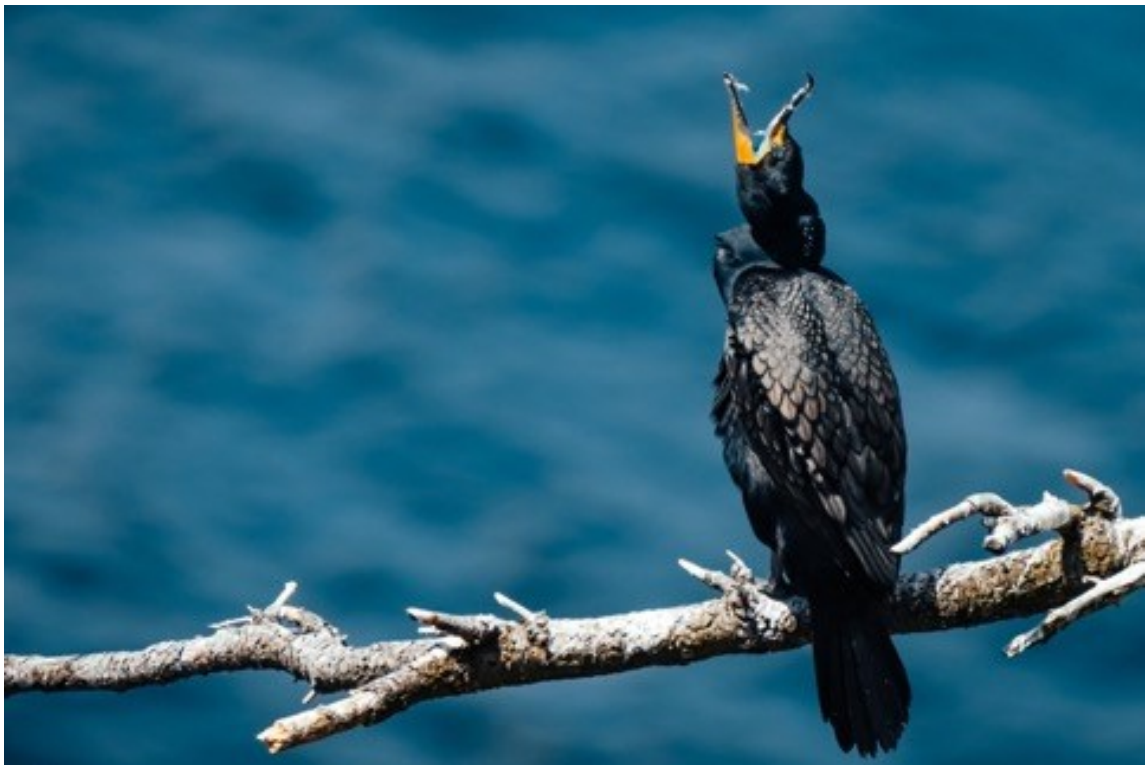


Figure 1-1. Double-crested Cormorant in breeding plumage.

Both Double-crested and Pelagic Cormorants (*P. pelagicus*) (Figure 1-2) have similar features with respect to their eyes, necks, and plumage. However, Pelagic Cormorants have thinner and slicker bills and necks (Dunn & Alderfer 2008); and are comparatively smaller and slimmer than the Double-crested Cormorants in size. In breeding plumage, tufts or crests appear on the Pelagic Cormorants' heads while white plumes are on both sides of their flanks (Dunn & Alderfer 2008). Breeding Pelagic Cormorant adults also have bills edged with red below their eyes (Dunn & Alderfer 2008). Both species have long wedged tails which are used as rudders during dives (Wires et al. 2001).

Figure 1-2. Pelagic Cormorants in breeding plumage.

Both cormorant species are resident throughout the year, with Pelagic Cormorants strictly breeding along coastal British Columbia, while Double-crested Cormorants not only breeding along British Columbia's coasts, but in the Interior, and in freshwater lakes (Van Damme & Colonel 2007). Cormorants are an agile diving seabird that propel themselves underwater with their feet using their noticeably stiff tail feathers as a rudder in pursuit of forage fish. Unlike other seabirds that prey on aquatic fish, cormorants do not have homogeneous feathers (Wires 2014). Their feathers consist of two-layered structures – an outer layer that is water permeable and an inner layer that is waterproof. The outer layer feathers allow less air to be trapped in the feather coat, making cormorants less buoyant (Wires 2014; Dorr et al. 2016), whereas the inner layer traps air and becomes a layer of insulation to prevent heat loss while hunting (Wires 2014). These features enable the cormorants to actively hunt for fish underwater and also dive frequently in dark waters (Wires 2014) overwintering as far north as the Aleutian Islands. Cormorants stand upright when perched on land or rocky habitats like cliff edges, rocky crevices, rocky slopes and islets, as well as hollows and burrows (Minias 2014). Similarly, cormorants dry their feathers by eagle-spreading their wings while perching on land.

Despite cormorants' high adaptability to the aquatic environment, they must return to land to lay eggs and raise their young. All species are awkward on land and therefore vulnerable during their breeding season to attacks from predators. Consequently, they have nested on cliffs and offshore islets (Dorr et al. 2016) to reduce the risk of terrestrial and other avian predators, occupying traditional sites year after year (Dorr et al. 2016).

Cormorants usually lay eggs once (Dorr et al. 2016) during each breeding but due to predatory events, some will have second clutches. Four eggs are the most common clutch size (Stenzel et al. 1995; Dorr et al. 2016), although clutch sizes as high as seven have been recorded (Wires et al. 2001; Dorr et al. 2016). Incubation lasts from 25-28 days (Moul & Gebauer 2002; Dorr et al. 2016) and is shared by both parents where 90 % of chicks achieve fledging when they are 24-day old (Dorr et al. 2016) at which time they are also able to walk. Within the 6th-8th week, fledglings will begin to fly, and by the 10th week, they will fledge their nests (Dorr et al. 2016).

1.1. Research Objectives.

This research targets the two species of cormorants that nest in the Salish Sea, the Double-crested and Pelagic Cormorants. The research focuses on nesting birds on the Ironworkers Memorial Bridge in the Metro Vancouver district and offshore seacliffs on Gabriola Island. While the main focus was the Ironworkers Memorial Bridge that hosts up to half of British Columbia's Double-crested Cormorant population (numbers derived from Chatwin et al. 2001; Carter et al. 2017), this research also investigated another important urban bridge in Vancouver, the Granville Street Bridge.

This study addressed multiple objectives. The first was to determine the best census method for breeding cormorants on the anthropogenic structures by comparing boat-based and point-count methods to high-resolution photogrammetric methods. The aim is to test the spatial and temporal scope, capabilities, limits and challenges of the technology used: (1) GigaPan®; (2) Sony; and (3) GoPro time-lapse cameras, in this novel cormorant monitoring in multiple different breeding locations. These numbers provided evidence of how and when the cormorants were using the urban bridges, primarily the Ironworkers Memorial Bridge. By using photogrammetric methods, it helped determine the basic biology and nesting phenology of the Double-crested and Pelagic

Cormorants on the urban bridges. This further provided baseline data on the date range of nest occupancy and fledging of juveniles on the Ironworkers Memorial Bridge.

The next study objective was by using spatial and temporal high-resolution photography of a subset of selected nests of both Double-crested and Pelagic Cormorants, to quantify the nest attendance patterns of both cormorant species. Further, this study was also set to test out Double-crested Cormorants' nesting distributions on the bridge relative to their reproductive successes, such as central-periphery pattern, proposed by Minias (2014), on artificial structures. This study hypothesized that similar to homogenous habitats that occur on offshore islets (Minias 2014), central-periphery nesting pattern is equally important on bridges, and thus the best cormorants nesting site on the Ironworkers Memorial Bridge was located at the curved central section. The second hypothesis was that cormorants nesting at the periphery of the Ironworkers Memorial Bridge did not have a higher nest resilience and success compared to the central nesting cormorants. Different nest activities were also investigated to prove that cormorant nests were disappearing after the breeding season.

This study aims to identify the importance of urban bridges in the Metro Vancouver district, and helped inform best management practices of bridges in the city of Vancouver. Because of the active breeding colonies of Double-crested Cormorants on the Ironworkers Memorial Bridge and Pelagic Cormorants on the Granville Street Bridge, data collected in this study were important to provide guidelines to contractors and the City of Vancouver pertaining to the work window of operation that could occur in and around the urban bridges in the Metro Vancouver district without disturbing breeding activities. This research also aims to provide a summary of cormorant activity on the bridges to aid the decision-making processes for the Ministry of Infrastructure and Transportation. These tools will ultimately contribute to the long-term population evaluation, monitoring, and management of nesting and breeding cormorants in British Columbia.

1.2. Past Conventional Monitoring Methods.

Breeding pairs of cormorants are difficult to census due to their remotely located and (sometimes) vertically-oriented colonies. Conventional monitoring surveys of cormorants have been conducted using in-person observation using boat-based

methods and binoculars. Studies on Triangle Island have been conducted in-person by using a viewing blind situated above the Pelagic Cormorant colonies so that the adult cormorants were surveyed when they were in standing postures (Hipfner & Greenwood 2009). However up to 2015, little was known about the timing and success of Pelagic Cormorant breeding colony sites along British Columbia coasts (Hipfner & Greenwood 2009), including those breeding on urban structures (Butler 2015; Hipfner 2015). The traditional census method for urban bridge occupancy involves looking up at near right-angles from a moving boat, making it difficult to observe all nesting and breeding birds. This lack of consistent census methods complicate interpretation of census data that could otherwise be used to compare among different breeding sites.

Conventional cormorant surveys at the Ironworkers Memorial Bridge and the Second Narrows transmission tower were boat-based and conducted from water under the bridge using an inflatable boat that carried three field surveyors – a boater, a counter, and a recorder (Carter & Drever 2016); except in 2018, survey was carried out by bridge maintenance crews using a 'traveller' (Hemmera 2018a, b; Hemmera 2019), a horizontal elevator that moved along the inner girders from the underside of the bridge. Additional challenges remain in counting cormorants from a boat is the proximity of humans during the census to nesting colonies. This can cause birds to exhibit a stress response that may lead to flushing from or abandonment of their nests (Chatwin et al. 2003). Another challenge is the hazard of estimating chick survival in offshore-islet nesting species where the already difficult-to-access field location adds further risks to both birds and humans. Boat-based surveys can be challenging to account for tracking nests from a moving platform, particularly when nests or chicks are only partially observed (Carter & Drever 2016; Halpin & Drever 2017). These limitations have inspired photogrammetric methods in this study.

1.3. Double-crested Cormorants.

Hatch & Weseloh (1999) described five main breeding geographical zones of the Double-crested Cormorants: Alaska, Pacific Coast (British Columbia to Mexico) (Chastant et al. 2014), U.S. and Canadian Interior (Alberta and Utah to St. Lawrence River) (Chastant et al. 2014), Southern U.S. (Wires et al. 2001; Wires & Cuthbert 2006; Dorr et al. 2016) and the Atlantic Coast (Wires & Cuthbert 2006; Dorr et al. 2016). The Pacific or Western (or the Pacific Flyway) population of Double-crested Cormorants

include those in Alaska, British Columbia, Washington, Oregon, Idaho, California, Nevada, Utah, Arizona, Montana, Wyoming, Colorado and northern New Mexico (Wires & Cuthbert 2006; Adkins et al. 2014; Chastant et al. 2014). Populations in the Interior U.S. and Canada have been increasing since the 1980, where there was a period of explosive growth resulted from the 1972's banning of Dichlorodiphenyltrichloroethane (DDT) insecticide (Wires et al. 2001; Wires & Cuthbert 2006; Wires 2014) that caused reproductive failure in the cormorants. However, in general, the Pacific population is declining (Chastant et al. 2014).

The 1916 Migratory Bird Convention between the US and Canada did not include the Double-crested Cormorant, and therefore it is not protected by the Canadian Federal Government (Wires et al. 2001; Adkins & Roby 2010), although the species receives protection at the provincial level (Adkins & Roby 2010). Double-crested Cormorants located in the geographical regions of the western Continental Divide in British Columbia are protected by Section 34 of the British Columbia Wildlife Act (BC Wildlife Act 1996; Adkins & Roby 2010), where, individuals are prohibited to harm, own, or destroy the species, egg, and nest, unless granted permission under the BC Wildlife Act 1996.

The Double-crested Cormorant is currently a Blue-listed species in British Columbia (B.C. Conservation Data Centre 1995; Machmer 2008; Machmer 2017) for the documented decline of coastal breeding cormorants. Between 1984 and 2001, there has been a two-third decline in the species (Machmer 2008), from 1607 pairs (Vermeer & Rankin 1984) to the most recent count of 602 pairs by Chatwin et al. (2001). Thus, the Double-crested Cormorant continues to be considered as a bird of special concern in British Columbia due to anthropogenic activities and disturbances, or natural pressures, like Bald Eagle predation (Sullivan 1998; Van Damme & Colonel 2007). The Double-crested Cormorant has been ranked S3 (i.e., Vulnerable) and S4 (i.e., Apparently Secure) since March 2015. Double-crested Cormorants were considered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to be Not at Risk (NAR) at the federal level, since April 1978 and another review in 2016. It is ranked by BC Conservation Data Centre (2021) as G5 globally. The G (Global) ranking refers to the entirety of the Double-crested Cormorant species that is globally common, and with its abundant population in other regions of Canada, the species is not vulnerable to extirpation or extinction, and is thus designated as G5, Secure under present conditions.

The first urban breeding colony of Double-crested Cormorants on man-made structures in British Columbia occurred at the Second Narrows transmission tower in 2009. The colony breeding site shifted to the Ironworkers Memorial Bridge between 2010 and 2014. The Double-crested Cormorant colony increased gradually from 2010 to 2018 (Carter & Drever 2016; Halpin & Drever 2017; Hemmera 2018a; Hemmera 2018b). Following the development of a management framework for the Double-crested Cormorants in the Western Population by Pacific Flyway Council in 2012 (Pacific Flyway Council 2013), the Ironworkers Memorial Bridge was recommended as one of the monitoring locations (Carter & Drever 2016). Sampling and monitoring of the Ironworkers Memorial Bridge started in 2014 during the incubation period, mid-June to mid-July (Carter & Drever 2016).

1.4. Pelagic Cormorants.

The Pelagic Cormorant is the most abundant cormorant in the province (Chatwin et al. 2003; Hipfner 2015) and the first pairs were documented on the Ironworkers Memorial Bridge (IWMB) in 1983 (Vermeer et al. 1989). Numbers of Pelagic Cormorants grew on the Ironworkers Memorial Bridge, and the population peaked at 200 nesting pairs in 2010. In 2014, Pelagic Cormorants numbers have decreased (Carter & Drever 2016; Halpin & Drever 2017).

The Pelagic Cormorant is not under the protection of federal Migratory Birds Convention (B.C. Conservation Data Centre 1994). However, this species is protected under Section 34 of the British Columbia Wildlife Act for which it is provincially Yellow-listed; also ranked S4 as Apparently Secure, and listed globally as G5 (B.C. Conservation Data Centre 1994). However, the recent population of Pelagic Cormorants in the Strait of Georgia in British Columbia between 1987 and 2000 has also declined from 2356 to 1088 (Chatwin et al. 2001; Carter et al. 2018).

1.5. Limiting Factors.

Van Damme & Colonel (2007) described colonial nesting birds, including cormorants, vulnerable to outside factors that determine their breeding success. Some of the limiting factors include atmospheric conditions, accessibility to food resources (Carter et al. 2018), nest site tenacity (Buckley & Buckley 1980) and longevity,

contaminants in food resources and nesting sites, disturbance and predatory events by humans (Carter et al. 2018) and other avian species like the Bald Eagle (*Haliaeetus leucocephalus*) (Carter et al. 2018). Bald Eagle predation has become one major concern in Double-crested Cormorant reproductive success after 1987 (Carter et al. 2018), where, in some circumstances, predatory events consequently resulted in nest abandonment (Sullivan 1998; Chatwin et al. 2001; Moul & Gebauer 2002). Disturbances incurred, such as panic, on the breeding cormorants caused reproduction failure due to unattended eggs (Hobson et al. 1989). There were also reports of Bald Eagle predation on cormorants breeding in Manitoba (Hunt et al. 1992). Bald Eagle attacks on cormorant chick was also observed by Van Damme & Colonel (2007), where, in some cases, some Double-crested Cormorants abandoned their nests following attempted attacks from Bald Eagles. Among major threats from Bald Eagles, Van Damme & Colonel (2007) also sighted disturbances or attacks from other avian predatory species, including Turkey Vulture (*Cathartes aura*), Cooper's Hawk (*Accipiter cooperii*), Red tailed Hawk (*Buteo jamaicensis*), Rough legged Hawk (*Buteo lagopus*), Merlin (*Falco columbarius*), Peregrine Falcon (*Falco peregrinus*), Common Raven (*Corvus corax*), and the more notorious Herring Gull (*Larus argentatus*) and Glaucous-winged Gull (*Larus glaucescens*) as Moul & Gebauer (2002) claimed. Van Damme & Colonel (2007) did not observe any flushing when non-avian sources, such as humans and aircrafts, were present, despite raising more alertness in the colonies.

1.6. Nest-site Selection.

Colonial breeding birds, like the cormorants, nest in central-periphery pattern within their colonies, and heterogeneity of the habitat plays an important role in their nest site selection, yet this theory has never been thoroughly researched (Minias 2014). Breeding pairs that do so in the more centrally located sites are found to be equipped with better parental traits as the parents are more fit regarding their reproductive success (Minias 2014). Predation pressure thought to be diluted in the centre of the colony, making the centre an attractive location for colonial birds to nest (Minias 2014). Minias (2014) asserted that seabirds exhibit strong central-periphery nesting distribution in homogenous habitats within their colonies. Homogeneity of a nest site contains similar attributes where nests are equally exposed to predation or adverse weather conditions Minias (2014) described 'heterogenous' as varied habitat structures including open

ledges, crevices, steep rocky edges and offshore islet, and burrows. Species in the Phalacrocoracidae family are not commonly studied with respect to their central-periphery nesting theory but colony nesting often occurs on heterogeneous habitat like open ledges on cliffs, rocky shores, crevices or caves that have lateral and overhang cover. These cliff sites are likely selected because of the abilities of these attributes to provide more protection against predatory events and weather extreme. For example, Velando & Freire (2003) found hatching success of a colony of European Shags (*Phalacrocorax aristotelis*), their hatching success was highly dependent on heterogeneous attributes because they were able to prevent flooding of broods from different weather conditions.

Coulson (1968) also noted that central locations that have superior nest sites usually have higher densities of birds because birds are physically fitter and are thus able to produce a larger brood as a resultant of diluted predatory events. It was also proposed by Velando & Freire (2001) that high-quality nest sites offer better protection against predators, suggesting a higher density of birds in the region, regardless if at the centre or not. The breeding birds that take up the edges in colonies are also found to be less experienced, younger, and of late nesters, therefore they do not occupy the central locations of breeding colonies, resulting in higher nest depredation by predators (Götmark & Andersson 1984; Elliot 1985 as cited in Janiszewski et al. 2017; McNeil & Léger 1987; Roberts 1996; Janiszewski et al. 2017).

Apart from central periphery nesting distribution proposed by Coulson (1968) and Minias (2014), Fogarty et al. (2017) highlight overhead covers are a thermal stress strategy in nest site selection and that these covers are able to help mitigate extreme heat events and predation. It is a prevalent factor in nest site selection that has been correlated with high reproductive output and survival in birds (Fogarty et al. 2017).

Atmospheric variables such as precipitation, humidity, and turbulence can also greatly affect nest site selection in birds. Turbulence in particular is addressed as a factor in deterring predators in detecting preys in some breeding colonies because high turbulent winds can dilute the detection of predators based on ‘visual, thermal, aural, and/or olfactory’ sensory signals (Fogarty et al. 2017).

Moul & Gebauer (2002) reported that Double-crested Cormorants have abundant nesting sites because the historical nest numbers in their colonies were comparatively higher. The concern is the inadequacy of protection from predators on the smaller colonies. Moul & Gebauer (2002) proposed that ground nesting cormorant colonies in the coastal British Columbia are more protected in contrast to the cormorant colonies that nested close to waters. Moul & Gebauer (2002) noted that Double-crested Cormorants' nesting sites are in general higher than that of Pelagic Cormorants, but both species nest in close proximity. Vermeer et al. (1989) also claimed that Pelagic Cormorants nested on open ledges of cliffs that are narrower compared to that of Double-crested Cormorants, and that their nests were comparatively lower above the water.

In the Salish Sea, there has been a shift in the nest site selection of cormorants from cliffs and offshore islets (Chatwin et al. 2003) to man-made structures like bridges and transmission towers (Butler 2015). These man-made structures are found within the City of Vancouver, a large urban centre of nearly 2.5 million people (Social Policy and Projects, City of Vancouver 2020). This proximity to the city may expose cormorants to anthropogenic stresses like commercial vessel transits, ferries (like the Aquabus), speedboats, and other small recreational boats (Chatwin et al. 2001) (for example, kayaks and dragonboats), higher ambient noise levels from vehicle and train traffic, as well as noise from Vancouver's industrial port activities. On the other hand, these man-made structures may make breeding cormorants immune from terrestrial predators and less vulnerable to aerial avian predation by Bald Eagles and gulls and therefore less prone to nest abandonment (Hipfner et al. 2012).

Cormorants generally breed in areas near waters (Dorr et al. 2016) that are accessible for feeding. Their nest sites include land, open ledges or cliff faces (Minias 2014; Dorr et al. 2016), rocky or sandy islands that are remote to humans, although trees are also a preference for breeding (Dorr et al. 2016). Moul & Gebauer (2002) and Dorr et al. (2016) also reported nests on piling and navigating channel markers, where similarly Hobson & Wilson (1984) reported nesting pairs of Pelagic Cormorants using lighthouse, docks, wooden tower, piers, and highway bridge substructures. Notwithstanding the traditional breeding grounds, they also establish multiple roosting grounds by using different types of habitats, including rocky shorelines

along rivers, oceans, and estuaries, marinas, piers, offshore islets, and the more recent trend has seen them using urban structures (Butler 2015; Dorr et al. 2016).

The Double-crested Cormorants are resident throughout coastal waters of British Columbia and the population occurs largely in the Strait of Georgia and Juan de Fuca Strait (Moul & Gebauer 2002). Double-crested Cormorants also breed in freshwater lakes throughout the province, such as Leach lake in the Creston Valley in southeast British Columbia, and Stum Lake in the Cariboo region of central British Columbia, as well as the lakes located eastern of Smithers and Dawson Creek in the central interior (Campbell et al. 1990; Moul & Gebauer 2002; Van Damme & Colonel 2007). Campbell et al. (1990) also reported interior nesting cormorants in Osoyoos, Okanagan, Canim, and Takla Lakes. In 1981, Meier found that cormorants preferred to breed on artificial structures like nesting platforms whereas Butler (2015) also suggested bridges and transmission towers as the recent habitat use for nesting cormorants.

Cormorant nests in British Columbia were reported to comprise materials ranging from small to longer sticks. Materials, like seaweed, grass and other ground vegetation, feathers, and rootlets, were heavily coated with their guano in nests (Rauzon et al. 2001; Moul & Gebauer 2002; Van Damme & Colonel 2007), and Van Damme & Colonel (2007) also added cormorant nests became larger later in the breeding season as they frequently layered new materials in the nests. Their nests also composed of various anthropogenic materials and debris including industrial chords, plastic bags, fishing lines and hooks, and paper (Campbell et al. 1990). Rauzon et al. (2001) also reported similar man-made composition in the nests on the Richmond-San Rafael Bridge in California, including tapes, balloon and tire debris, latex gloves, cigarette packs, and sunglasses. Tree nesting cormorants were reported to build their nests that were well-lined with sticks and green leaves (Ehrlich et al. 1988, as cited in Moul & Gebauer 2002). Their nests on trees were found 20-35 m above ground (Van Damme & Colonel 2007). Unused nests were reclaimed and dismantled to be incorporated into new nests, and nest were also removed annually by winter storms (Rauzon et al. 2001; Moul & Gebauer 2002).

1.7. Cormorant Management.

Vancouver is a coastal city that is located to the east of the Salish Sea, to the west of the Coast Mountains, to the South of Howe Sound, and to the north of US border and Washington State (City of Vancouver 2018). It is an urban city that is rich in coastal features and rivers, such as the Burrard Inlet, False Creek, Howe Sound, Fraser River, and the Salish Sea. Bridges in Vancouver are important for moving millions of cars a day into and out of the city (Public Sector Digest 2016). Therefore, management for the safety and maintenance of these critical structures is a major concern for the Ministry of Transport and Infrastructure (MOTI) (Hemmera 2018a, b; Hemmera 2019) and the City of Vancouver's engineering department. Currently, exclusionary measures have been put up on multiple Vancouver bridges in the belief that cormorant's acidic guano (Dorr et al. 2016) may affect activities like bridge inspection, maintenance, and management. Highly reactive chemicals and salts, such as sodium and magnesium, in the bird feces when accumulated on the concrete and steel highway structures, will become potential factors that affect the structure's integrity and longevity when the chemicals corrode the structures (Huang & Lavenburg 2011). The authors also summarized that nonetheless, the effects of bird droppings on the health, especially life cycle, of highway structures were less studied. As for cormorants, their ammonia-rich droppings are proven to have detrimental impacts on vegetation, killing trees or ground vegetation at their breeding sites (Wires et al. 2001; Dorr et al. 2016) but no studies have clearly established the effects of their guano on property and infrastructures, except on private property (Wires et al. 2001).

In the Pacific Northwest region, more attention and interests have been focused on Double-crested Cormorants because of their large consumption of the juvenile salmonid (*Oncorhynchus* spp.), especially in the Columbia River estuary (Collis et al. 2002; Roby et al. 2003; Anderson et al. 2004; Clark et al. 2006). The Double-crested Cormorant population on East Sand Island in the Columbia River estuary was reduced by lethal measures managed to prevent depredation of juvenile salmonids, but little is known about the effect this had on estuary ecosystem (Brown 2019). A lot of research focussed on their consumption of the salmon smolts (Adkins & Roby 2010) that were reduced to a smaller number once lethal (Brown 2019) and non-lethal control measures were involved at natural breeding sites. Double-crested Cormorants are however

perceived as pests in eastern Canada over the concerns of their impacts on commercial and sports fishing industries (Hatch & Weseloh 1999; Adkins & Roby 2010; Blaise 2019). They are also unpopular as their droppings are destructive to vegetation and property (Adkins & Roby 2010; Blaise 2019). This has led to current legal control measures, like culling, annual hunting seasons from March 15 to December 31 (Blaise 2019), and issuance of depredation permits in most central and eastern Canadian provinces to control their populations (Blaise 2019). However, without proper scientific evidence that cormorants cause a direct decline in the salmonid populations, current management and frameworks place Double-crested Cormorants as the scapegoats for the declining health of the fish population, particularly in the Columbia River estuary (Waters 2015).

Chapter 2.

Study Sites in Research Area.

My study took place at three cormorant breeding colonies in the Salish Sea in the province of British Columbia, Canada (Figure 2-1 and Table 2-1). This research targeted two cormorant species that occur in the urban city of Vancouver and on offshore islands and islets in the Salish Sea. Within this research area, the monitoring study takes place at two urban bridges in the City of Vancouver and at one of the Gulf Islands in the Strait of Georgia. The primary research area in Vancouver was at the Ironworkers Memorial Bridge which spans a major shipping channel into Burrard Inlet. I also selected a secondary urban bridge, the Granville Street Bridge, that spans False Creek. A third sampling site was selected on Gabriola Island at a natural cormorant breeding colony.

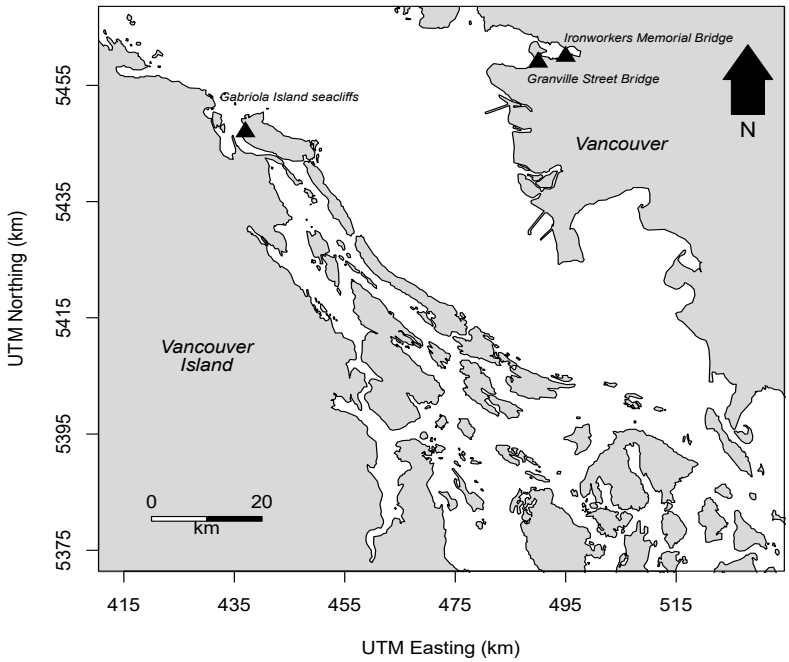


Figure 2-1. Map and locations of Double crested and Pelagic Cormorants monitoring in Vancouver, and the Strait of Georgia, British Columbia. Dark triangles represent three research areas.

Located at the western mouth of Seymour River, Ironworkers Memorial Bridge (Figure 2-2) crosses the eastern (i.e., the second) narrows of the Burrard Inlet. Ironworkers Memorial Bridge is a 1,292-m cantilever steel truss bridge constructed in 1960 that stretches from East Vancouver to North Vancouver (49° 17' 53.0802" N, 123° 1' 29.8086" W). It serves as a six-lane highway between Vancouver and the North Shore (Halpin & Drever 2017) and is part of Trans-Canada Highway 1.

About 35-40 m east of the Second Narrows Rail Bridge, a transmission tower or also known as the Power Tower is located on cemented foundations next to the main shipping channel used by Port of Vancouver. Crossing the Second Narrows in the Burrard Inlet, this electrical transmission tower is one of the 16 transmission lines that stretch to Boundary Road. It is red-and-white painted and owned by BC Hydro (or British Columbia Hydro and Power Authority).

Historically, cormorant breeding colonies were identified on both the Ironworkers Memorial Bridge and the electrical transmission tower. However, starting in 2010, the Double-crested Cormorants shifted their nests such that in 2020, nesting cormorants only occur on the Ironworkers Memorial Bridge (Carter & Drever 2016).

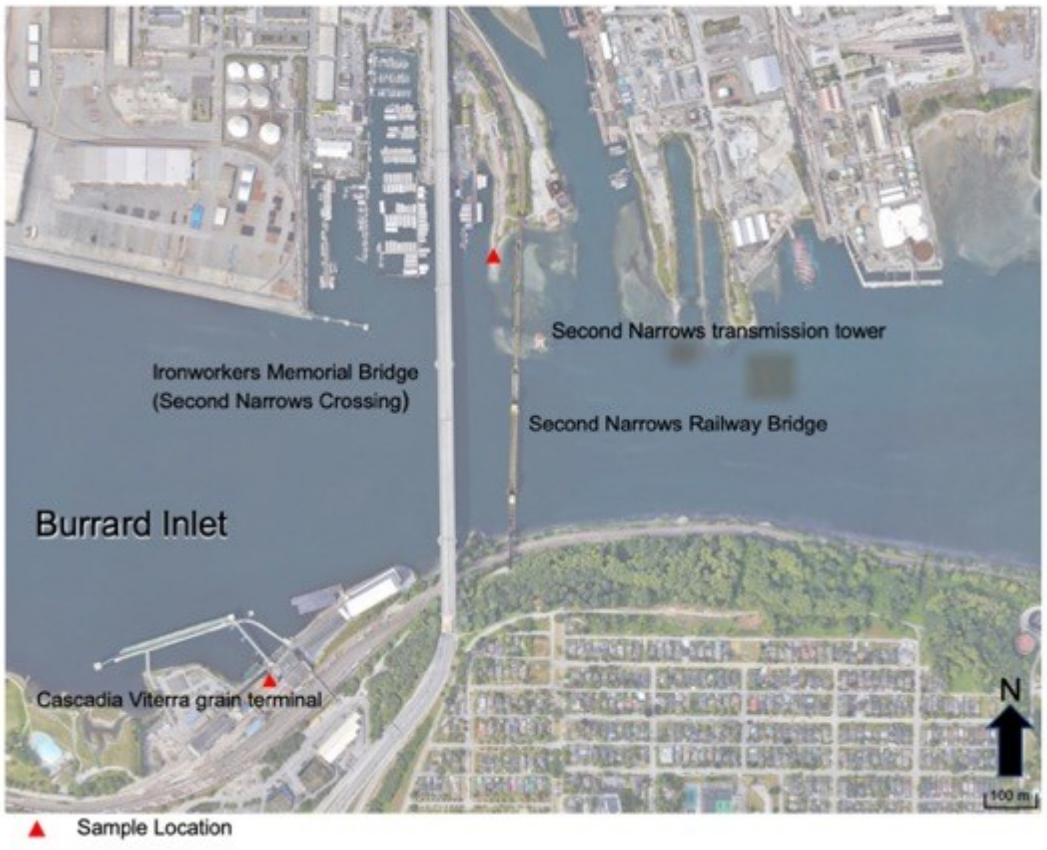


Figure 2-2. Sample locations for the Ironworkers Memorial Bridge in Vancouver, British Columbia.

Images of the Ironworkers Memorial Bridge were obtained from two sampling locations: (1) Outside Squamish Nation Reserve, and (2) Viterra Cascadia Terminal (Figure 2-2). Both sample locations have different vantage that oversaw the Ironworkers Memorial Bridge from both sides.

The Granville Street Bridge, that spans False Creek inlet, is an eight-lane bridge that connects Vancouver's downtown with Granville Island. The bridge is maintained by and under the jurisdiction of the City of Vancouver (City of Vancouver 2020).

Finally, Gabriola Island is one of the southern Gulf Islands in the Salish Sea of British Columbia located between Northumberland Channel and the Strait of Georgia. It is a 5,256-hectare island, 14 km long, and 4.2 km wide that is accessible by a 20-minute ferry ride from the City of Nanaimo.

Gabriola Island was shaped by geological events such as glaciations and erosional processes. Further, tectonic activities also transformed the island's landscape, and as a result Gabriola Island has a distinct number of bays and seacliffs. These geological processes resulted in the underlying sedimentary bedrock to be entirely made up of sandstone, mudstone, and conglomerate along the island's coastline (Islands Trust 2008).

With the island surrounded by bays, Gabriola Island is frequented by many wildlife species, especially birds, such as the Bald Eagle, Turkey Vulture, and Peregrine Falcon (Islands Trust 2008). As Gabriola Island is situated on the Pacific Flyway, it makes the island a strategic area for migrating birds seeking for wintering habitats and breeding grounds, and also that these bird species are common throughout the year on the island (Islands Trust 2008). Located on the western coastline of Gabriola Island are the seacliffs where Double-crested and Pelagic Cormorants breeding colonies are located. These sandstone cliffs have been eroded and carved by wind and ocean forces to create systems of ledges rock crevices and cracks some with small trees that provide nesting and breeding habitat for these two species of cormorants.

There is direct access to the Salish Sea below the cliffs for the nesting Double-crested and Pelagic Cormorants. The seacliffs are mostly open ledges while some ledges have overhangs. Cormorants also nested in the sandstone crevices of the cliffs, and tree-nesting cormorants also occurred but were rare.

I selected two locations of different elevations and vantage for GoPro time-lapse camera deployment at the nesting Double-crested Cormorant colonies on Gabriola Island. One GoPro time-lapse camera (renamed Seabird 3) was mounted on a boulder below the seacliffs that had an elevated vantage point, while another GoPro time-lapse camera (Seabird 2) was placed on a 90° cliff surface that oversaw another subset of breeding colony of Double-crested Cormorants, with all solar panels faced east for optimal power during daylight hours. Due to the remoteness of the cliff, Seabird 3 was only accessible by kayaks while Seabird 2 was mounted below a private resident's backyard.

To conduct additional surveys, another sampling was carried out at Jack Point and Biggs Park in Nanaimo, British Columbia, with a 1.7 km distance across the seacliffs (Figure 2-3).

Figure 2-3. Additional sample location for the nesting cormorants on Gabriola Island seacliffs in British Columbia.

In total, there were five sample locations used in monitoring the three cormorant colonies in Vancouver in this study (Figure 2-4).

Table 2-1. Research sites, sample locations, and sampling dates for Double-crested and Pelagic Cormorant breeding season in 2020 in Vancouver, British Columbia.

Study site and sampling locations	Sampling coordinates	Start date	End date	Remarks
Ironworkers Memorial Bridge				
Outside Squamish Nation Reserve	49° 17' 53.0802" N, 123° 1' 29.8086" W	June 1, 2020	March 5, 2021	See 2.1. and 3.2.
Viterra Cascadia Terminal	49° 17' 27.8" N, 123° 1' 48" W	May 19, 2020	June 8, 2020	See 2.1. and 3.2.
Granville Street Bridge				
Granville Island public market outdoor deck	49° 16' 22.44" N, 123° 8' 4.8012" W	May 1, 2020	October 7, 2020	See 2.2. and 3.3.
Gabriola Island seacliffs				
Gabriola Island	49° 10' 6.768" N, 123° 52' 16.314" W	May 23, 2020	August 15, 2020	See 2.3. and 3.4.
Gabriola Island	49° 10' 6.3” N, 123° 52'14.6" W	May 8, 2020	August 15, 2020	See 2.3. and 3.4.
Jack Point and Biggs Park	49° 10' 6.7” N, 123° 52'14.2" W	May 1, 2020	June 4, 2020	See 2.3. and 3.4.2.

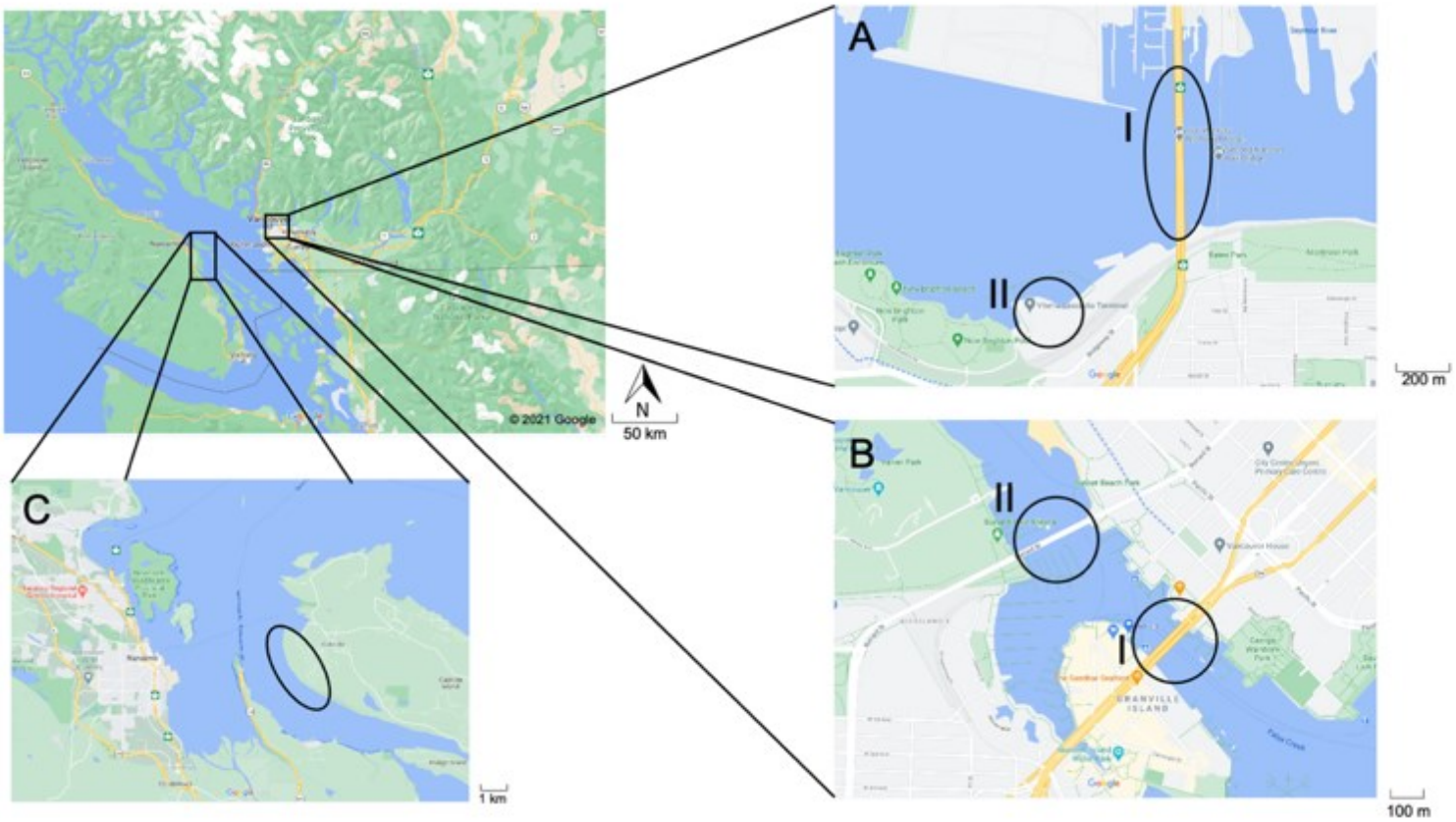


Figure 2-4. **Research maps and sample locations. The black circles indicate the sample locations of the urban and natural breeding colonies in Vancouver and Nanaimo in British Columbia. (AI) depicts the Ironworkers Memorial Bridge and (AII) is Viterra Cascadia Terminal. (BI) shows the Granville Street Bridge and (BII) the Burrard Street Bridge. (C) indicates the Gabriola Island seacliffs.**

Chapter 3.

Photogrammetric Methods.

This study focused on using photogrammetric methods to monitor the breeding season for the Double-crested and Pelagic Cormorants nesting at the three locations selected for monitoring within the Salish Sea. High-resolution camera systems were used to create individual, high-resolution image to expand existing ecosystem monitoring and management of Double-crested and Pelagic Cormorants in the region.

There was a delay in the start of my 2020 summer field season. Due to the onset of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2, or COVID-19) pandemic that the Province of British Columbia declared a public health emergency and state of emergency with restrictions imposed from March 18, 2020 (Public Safety and Solicitor General 2021). This corresponded with the start of the cormorant breeding season in early April. My field season began on May 8, 2020, for Gabriola Island, and May 19 from the Viterra Cascadia Terminal for the Ironworkers Memorial Bridge, and May 11, for the Granville Street Bridge.

3.1. GigaPan Robotic and Sony Camera Systems.

Established in 2008, GigaPan was a collaborative research between the National Aeronautics and Space Administration (NASA) and Carnegie Mellon University that is envisioned to allow users to create impactful and high-resolution panoramic imageries, especially with their GigaPan EPIC Pro series (GigaPan 2013). GigaPan EPIC Pro series is a robotic camera system technology developed by GigaPan Systems Panoramic Photography Equipment and Software Company, or also known as GigaPan, that was deployed by NASA Mars Spirit and Opportunity rovers to capture precise and detailed high-definition panoramic images on Mars (GigaPan 2013; National Aeronautics and Space Administration 2017). Widely known as gigapixel photography, GigaPan systems produce robotic mounts that can be attached with a wide range of camera and lens weighing up to 10 lbs that take hundreds of images that are then stitched into one (Table 3-1) (GigaPan 2013).

Table 3-1. Photographic equipment and storage used in sample location, the Ironworkers Memorial Bridge in Vancouver, British Columbia.

No.	Equipment	Maker	Model/Description	Quantity
1.	Camera	Sony	α7R IV 35 mm full-frame camera with 61.0 MP	2
2.	Lens	Sony	FE 200–600 mm F5.6–6.3 G OSS	2
3.	Battery	Sony	NP-FZ100 rechargeable Lithium-ion battery with 2280mAh	4
4.	GigaPan	GigaPan	GigaPan EPIC Pro robotic camera mount with additional battery kit	2
5.	Tripod	Manfrotto	Befree Advanced Aluminum travel tripod	1
6.	Memory storage	SanDisk	Extreme Pro 170MB/s UHS-I U3 V30 128GB SDXC™	2
7.	Memory storage	Lexar	Lexar Professional 1667x SDXC™ UHS-II 256GB	2
8.	Cable	GigaPan	Sony-GigaPan S2 10-pin Micro USB connector cable	1

In my study, the GigaPan system included a camera on the GigaPan mounted on a tripod. The system used a Sony (Sony Corporation, Tokyo, Japan) α7R IV Digital SLT (DSLT) camera through a Sony FE 200-600 mm lens without any filters. The camera system and GigaPan were synchronized using the Sony-GigaPan S2 Micro 10-pin connector cable to the camera's Micro USB connection. The storage was interchanged between two different cards, SanDisk and Lexar, to store the sampling images to their maximum capacity, before deleting the images chronologically for new sampling images (Appendix A).

3.2. Ironworkers Memorial Bridge.

3.2.1. Vantage Point on Shores of North Vancouver.

A full cormorant count entailed a census to cover all spans of the Ironworkers Memorial Bridge from East Vancouver to the North Shore. There are eight concrete piers at the base of the Ironworkers Memorial Bridge from East Vancouver to North Vancouver. These eight piers support five major spans, from Span 0 to Span 4. Span 0 is the portion of the bridge connecting to East Vancouver with most sections above vegetation and the railway. Span 1 is the portion of the bridge that is used by the Port of Vancouver as the main shipping channel in the Burrard Inlet and host to the second highest number of Double-crested Cormorant nests. Span 2 is entirely over water and adjacent to the main shipping channel. It is also the primary monitoring location in my study and the portion of the bridge where the highest density of Double-crested Cormorant nests occurred. Span 3 is predominately over water, but is connected to land in North Vancouver at its northern limit. Span 3 was monitored in my study and was where most Pelagic Cormorant nests occurred. Span 4 was not monitored but has similar bridge structures on which a small number of Pelagic Cormorant nests were observed.

Using the GigaPan system, I sampled Span 2 and Span 3 from the rocky shore outside Squamish Nation Reserve, between the Second Narrows electrical transmission tower and the Ironworkers Memorial Bridge at a consistent location about 200 m distance from the sampled spans (Figure 3-1 and Figure 3-2). From this same consistent location, I created one GigaPan Stitch image for Span 2 that focused on Double-crested Cormorant nesting on the 10 sections (Figure 3-3), and another for Span 3 that focused on Pelagic Cormorant (Figure 3-4). This study followed the same protocol and assumptions that Moul & Gebauer (2002) proposed, that is I counted nests, where each nest represented one breeding cormorant pair. Heights above high water were also recorded for some major lateral bracings (Appendix F) with a TruPulse® 360/360B by Laser Technology Inc. rangefinder.

Figure 3-1. **Sampling designs of the Ironworkers Memorial Bridge in Vancouver, British Columbia. The Ironworkers Memorial Bridge was divided into 5 spans, from Span 0-4, between 8 piers where sampling was done across the Squamish Nation Reserve and Cascadia Viterra grain terminal (represented in red triangles).**

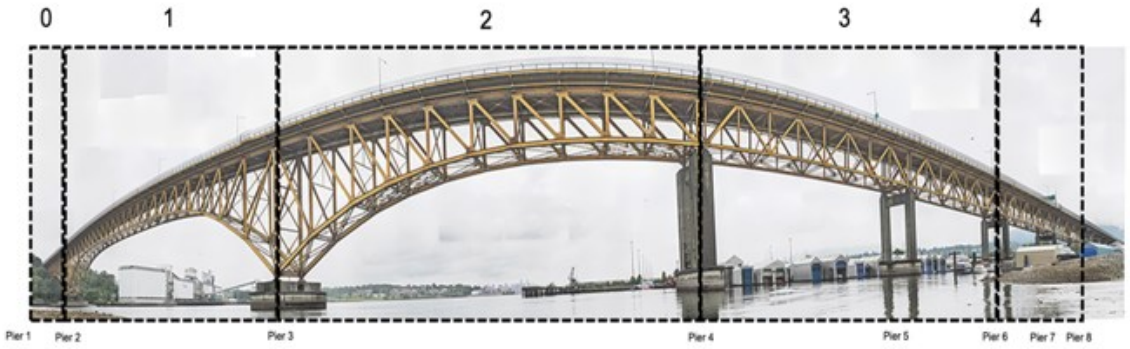


Figure 3-2. **Sampling design for full cormorant population count and individual span count. Ironworkers Memorial Bridge in Vancouver, British Columbia was divided to 5 spans, from 0-4, that was supported by 8 piers, from East Vancouver to the North Shore. 0-4 indicates span numbers.**

Figure 3-3. Span 2 of the Ironworkers Memorial Bridge in Vancouver, British Columbia, was divided into 10 sections, to monitor the Double-crested and Pelagic Cormorants colonies. 1-10 indicates section numbers.

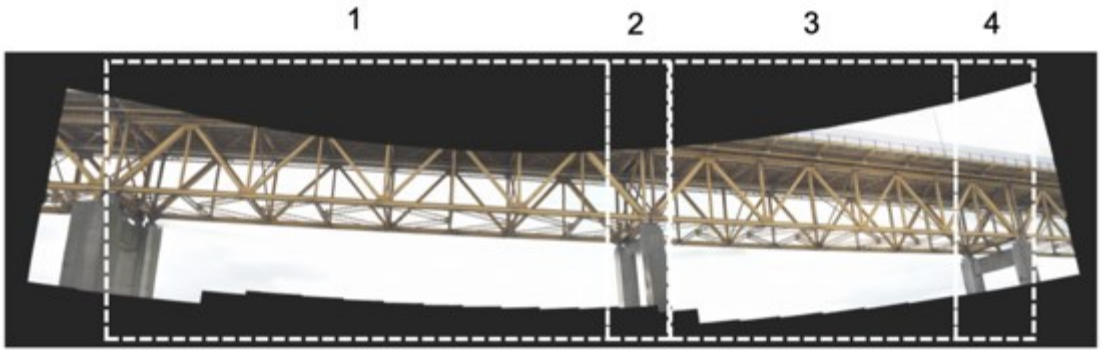


Figure 3-4. Span 3 of the Ironworkers Memorial Bridge in Vancouver, British Columbia, was divided into four sections according to the similar bridge attributes for Pelagic Cormorants monitoring. The 4 sections comprised 16 sections from Piers 4-6. 1-4 indicates section numbers.

3.2.2. Viterra Cascadia Terminal.

Another consistent GigaPan sample location for the Ironworkers Memorial Bridge was selected with a vantage point on the East Vancouver side of the second narrows and the Ironworkers Memorial Bridge. The GigaPan system location was on top of the middle Viterra Cascadia Terminal building (Appendix L). The GigaPan robotic and Sony camera systems were placed on the terminal's rooftop to capture images of the west side of the Ironworkers Memorial Bridge. Due to the exposed location (I anticipated rain,

wind, and heat), the sample equipment had to be stored in a weather-proof enclosure, while minimizing technical errors that might arise due to the difficult-to-access location.

3.3. Granville Street Bridge.

Images were taken at the Granville Street Bridge by following similar sampling designs developed for the Ironworkers Memorial Bridge. The sampling focused on the 14-section portion of the bridge above water (Figure 3-5) and monitored from a west side perspective.

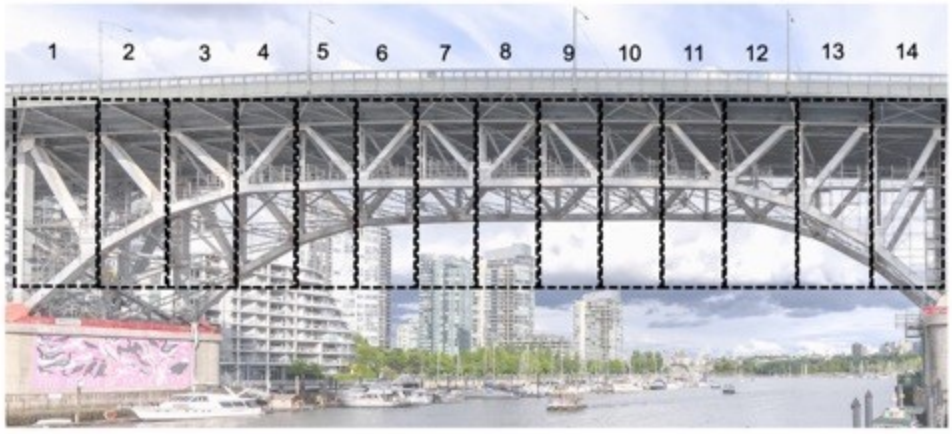


Figure 3-5. Monitoring of cormorants on the Granville Street Bridge in Vancouver, British Columbia focused on 14 above-False-Creek sections that were situated between two piers. 1-14 indicates section numbers.

3.4. Gabriola Island Seacliffs.

3.4.1. GoPro Time-lapse Cameras.

The remote GoPro (GoPro, Inc., California, United States) time-lapse camera deployment consisted equipment that were from CamDo Solutions (Table 3-2 and Appendix A). The system comprised a 4K quality GoPro HERO7 camera, weather-proof enclosure, solar kit, and swivel mount kit. The GoPro camera set to monitor the cormorant colonies was controlled by a time-lapse controller and the whole kit was powered by a solar-charged V50 battery, and triggered by a BlinkX timer controller installed in the weather-sealed enclosure. The GoPro camera kit was housed inside a

rugged and weather-proof outdoor enclosure. The outdoor enclosure kit consisted of a DryX Enclosure, 67 mm diameter lens filter, V50 battery pack, V50 USB charging cable, V50 Female Barrel to Micro-USB charging cable, Male to Female 3.5 × 1.1 mm Barrel power cable, and Male Barrel to USB-A USB charging adapter. To constantly charge the V50 battery pack, the DryX enclosure was attached to a solar kit that contained a solar panel, ball-socket arm, 2F-1M splitter cable, lock washer, and a 1" ball mount with 1/4"-20 threaded post. Multiple bags of silica gels were placed in all GoPro camera enclosures, and then securely locked with two TSA mini padlocks (Figure 3-6A). The whole GoPro monitoring system (Figure 3-6B) was mounted on the cliff surface and boulder with a mounting base with swing arm and 2.75" spaced ball-plate by using four bolts. The mounting of the enclosure kit was modified so that the monitoring equipment was bolted deep into the sandstone cliff (Figure 3-7 and Figure 3-9).

Table 3-2. GoPro time-lapse cameras and equipment that were deployed on the sample location, Gabriola Island seacliffs, British Columbia.

No.	Equipment	Maker	Model/Description	Quantity
1.	GoPro camera	GoPro	HERO7 Black	2
2.	Mount kit	CamDo Solutions	Swivel Mount Kit Outdoor Enclosure	2
3.	Camera controller	CamDo Solutions	BlinkX Time Lapse Controller for GoPro	2
4.	Solar panel kit	CamDo Solutions	SolarX Solar Kit	2
5.	Camera enclosure	CamDo Solutions	DryX Weatherproof Enclosure	2
6.	Memory storage	SanDisk	Extreme MicroSDXC UHS-1 U3 A2 64GB	2

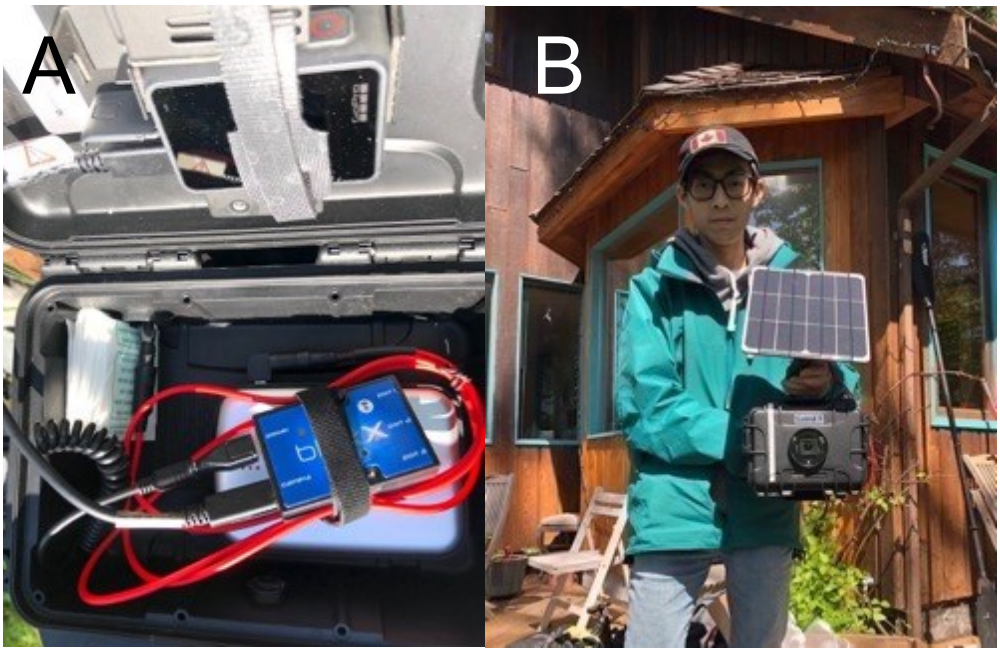


Figure 3-6. (A) GoPro time-lapse camera setup; and (B) a complete GoPro camera setup, together with the solar panel, at the Double-crested Cormorant colony on Gabriola Island seacliffs in British Columbia.

Note: Photograph B by Ruth Joy, 2020.

The first GoPro camera renamed as Seabird 3 was initially mounted on a 10-m boulder on May 8, 2020, to start monitoring (Figure 3-7 and Figure 3-8). The camera was set to record two 60-second videos per day every 12 hours starting at 6 p.m. on May 8, 2020. Another GoPro camera named Seabird 2 was deployed on Gabriola Island seacliffs on May 23, 2020 to monitor another subset of Double-crested Cormorant colonies that were nesting on open ledges of the cliffs (Figure 3-19 and Figure 3-10). To obtain another time series of photographs, the GoPro camera was prescribed to take three photographs every two hours, beginning from 2 p.m. on May 23, 2020. The camera was triggered by the BlinkX timer in which each trigger reactivated the camera to wake for 60 seconds and then take photographs between the 30-second interval, summing to 12 recording sessions per day during the studied duration. The equipment was scheduled to stop image recording on August 15, 2020.

Figure 3-7. GoPro Seabird 3 (circled) mounted on the boulder at the foot of Gabriola Island that monitored breeding cormorant colonies.

Note: Photograph by Trudy Chatwin, 2020.

Figure 3-8. Vantage of GoPro time-lapse camera (Seabird 3) that monitored the sandstone crevice and cliff ledge nesting cormorants.

For analysis and monitoring, the Double-crested Cormorant colonies on the seacliffs were divided into three sections: (A) tree, (B) cliff ledge (in the middle ground), and (C) cliff ledge nesting cormorants in the foreground. The nesting cormorants were also categorized according to their nesting attributes – cliff nesting cormorants are represented by red, and green corresponded to tree nesting cormorants (Figure 4-11 in Chapter 4). Nests from foreground to background were given unique IDs, and then Double-crested Cormorant adults, chicks, and juveniles in the later stage of breeding season were identified with similar identification attributes to that of the Ironworkers Memorial Bridge. They were tracked across the 84-day sampling and their habitat use on the Gabriola Island seacliffs was investigated.

Figure 3-9. Location of GoPro Seabird 2 mounted on the sandstone cliff on Gabriola Island that monitored Double-crested Cormorants in the breeding season.

Note: Photograph by Alex Harris, 2020.

Figure 3-10. Vantage of GoPro time-lapse camera (Seabird 2) on Gabriola Island seacliffs that monitored the Double-crested Cormorants nesting on cliff ledges and trees.

3.4.2. GigaPan at Jack Point and Biggs Park.

A single cormorant survey using the GigaPan robotic and Sony camera systems was conducted at Jack Point and Biggs Park in Nanaimo, British Columbia (Figure 2-3).

3.5. Additional Survey Methods.

In addition to the GigaPan and GoPro imaging, a traditional nesting survey was completed using binoculars. Field volunteers used one of the following pairs of binoculars: 8×42 Eagle Optics Denali™ binoculars, Zeiss 8×40 or Swarovski SLC 8×30 WB. This was a boat-based survey that counted cormorants at the Gabriola Island seacliffs on July 18, 2020. This traditional survey was conducted by three surveyors in two kayaks where all nesting adults were counted using binoculars.

3.6. Image Analyses.

3.6.1. GigaPan Stitch and PTGui Pro Image Processing.

All analyses were done with either available and pre-existing freeware accessible for download at the official, http://www.gigapan.com/cms/support/download-gigapan-stitch, or GigaPan's distributor's website, https://omegabrandess.com/gigapan/;or software purchased from https://www.ptgui.com/. All image processing and data logging ran on computer equipped with macOS and Microsoft Windows. Only JPEG images were used in the image processing and analyses. Images of other formats, like TIFF, can be used, but due to limiting RAM of the OS, their large sizes became an issue with the computing systems processed the images.

GigaPan analyses started with image preparation, and followed by image processing, where, images from sample locations were aligned, and then stitched in GigaPan Stitch v2.3.0306. Images generated from the software were consequently exported and analyzed (Appendix D).

Desktop analyses followed each sampling where all image tiles were transferred into a Seagate 4TB external hard drive which and stitched into one individual GigaPan panoramic image using GigaPan Stitch 2.3.0306 and PTGui Pro v11.31. Vignette correction was turned off to prevent inconsistent light exposures in the panoramic photographs. Images taken and stitched across the sampling duration at the study site were analyzed with Apple® MacBook Air version 10.14.2 and MacBook Pro version 10.14.6, as well as Microsoft® Surface 6 Pro version 1909. The panoramic images were examined for breeding activities such as cormorants nest attendance and breeding success on the Ironworkers Memorial Bridge.

A full cormorant population count was conducted. This entailed all adult and juvenile cormorants on the lateral bracings across all spans of the Ironworkers Memorial Bridge (Appendix B). As keeping track of all individual nests in the stitched images across time was a laborious effort, I chose 23 lateral bracings on Span 2 (Section 3.2.1. and Figure 3-3) to investigate and quantify nest occupancy. Nest tracking included documenting when individual nests appeared and disappeared from Span 2 on the

Ironworkers Memorial Bridge (All sampling metadata can be accessed at Appendix I and Appendix J).

On Span 3, most Pelagic Cormorants nested on plates that bracings and girders meet on Sections 1 and 3, whereas nesting at Section 2 and 4 occurred on the bottom flanges of the girders (Figure 3-11). Individual Pelagic Cormorant nest on Span 3 was not tracked in a temporal range. Therefore, only a full population count was derived from this span.

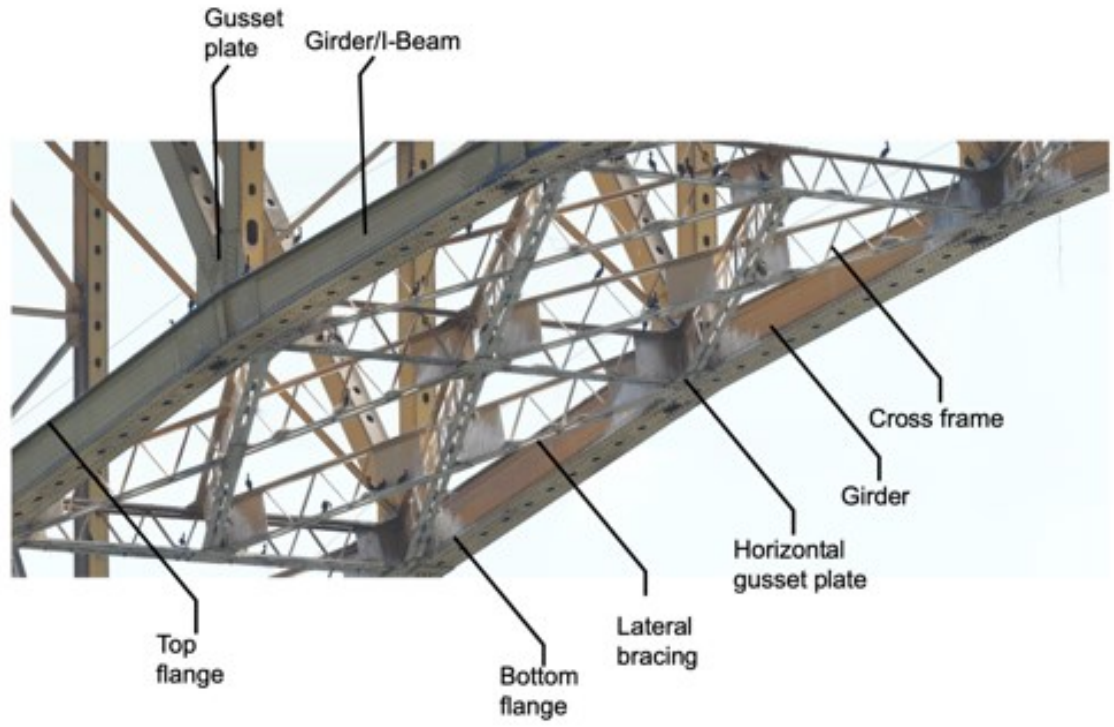


Figure 3-11. Structural components of the Ironworkers Memorial Bridge in Vancouver, British Columbia.

3.6.2. GoPro Time-lapse Image Processing.

Images taken using the GoPro time-lapse settings were transferred to computers before identifying the nesting cormorants. The images were taken with Protune turned to 'off' ensuring there was no manual adjustments of the camera once the camera was set up. Post-breeding season, after the recovery of the camera, the images from, GoPro cameras required no post-processing or stitching but adult and juvenile cormorant

counts were made for each active nest captured in the time-lapse camera field of view (Appendix D).

Chapter 4.

Results.

This study covers 10 months of image recording for the Ironworkers Memorial Bridge from the Squamish Nation Reserve (Appendix K). The first image of the Ironworkers Memorial Bridge was taken on June 2, 2020 and the final image was taken on March 5, 2021. Other sites had fewer days of effort. At the Gabriola Island seacliffs, imagery began on May 8, and concluded on August 15, 2020. Photogrammetry used two image capture systems, with the GigaPan and Sony camera systems predominately used at the Ironworkers Memorial Bridge, and a GoPro time-lapse camera used to document cormorants at the Gabriola Island seacliffs.

4.1. Ironworkers Memorial Bridge.

A full Ironworkers Memorial Bridge population count (Span 0 to Span 4) of the Double-crested Cormorant population recorded 296 nests and 433 individuals (including chicks) (Table 4-1 and Table 4-2). This count was based on rendered GigaPan images taken between July 8 and 10, 2020 (Table 4-2). The higher nest rims on Pelagic Cormorants made it harder to observe birds inside nests, however I recorded 61 Pelagic Cormorant nests across the Ironworkers Memorial Bridge and 43 individual Pelagic Cormorants (Table 4-3).

Table 4-1. Numbers of Double-crested Cormorant, and Pelagic Cormorant nests on Ironworkers Memorial Bridge in Vancouver, British Columbia, conducted on July 8 and 10, 2020. Blank, or missing values indicate that no survey data was available. Pelagic Cormorants population decreased since the peak population count in 2010 and that their colony on the bridge must also be protected. DCCO and PECO indicate Double-crested Cormorants and Pelagic Cormorants.

Survey Year	DCCO	PECO	Source
1983		10	Chatwin et al. 2002
1987		90	Chatwin et al. 2002
2000	0	201	Chatwin et al. 2002
2009	53-63[a]	130	Carter 2014a, b; Carter and Drever 2016; Halpin and Drever 2017
2010	69-72[b]	231-256[c]	Carter 2014a, b; Carter and Drever 2016; Halpin and Drever 2017
2014	141-142[d]	116-124[e]	Carter 2014a, b; Carter and Drever 2016; Halpin and Drever 2017
2016	248	106-113[f]	Carter and Drever 2016
2017	288[g]-299[h]	166-168[i]	Halpin and Drever 2017
2018	298	128	Hemmera 2018a, b; Hemmera 2019
2020	296	61-70[j]	This study

[a] Observers counted 53 nests and 10 were suspected to be possible nests but not visible to the observers (Carter and Drever 2016; Halpin and Drever 2017).

[b] Observers counted 69 nests and 2-3 were suspected to be possible nests but not visible to the observers (Carter and Drever 2016; Halpin and Drever 2017).

[c] Observers counted 231 nests and 15-25 were suspected (Carter and Drever 2016; Halpin and Drever 2017).

[d] Observers counted 141 nests and 1 was suspected to be possible nest where bird was standing but possible nest could not be identified (Carter and Drever 2016; Halpin and Drever 2017).

[e] Observers counted 116 nests and 8 nests were suspected (Carter and Drever 2016; Halpin and Drever 2017).

[f] Observers counted 106 nests and 7 were suspected where nests were possible but not visible to observers (Carter and Drever 2016).

[g] Observers counted 288 nests but did not include the two empty nests on the B.C. Hydro's electrical transmission tower (Halpin and Drever 2017).

[h] Observers counted 288 nests and 11 were suspected (Halpin and Drever 2017).

[i] Observers counted 166 nests and 2 were suspected (Halpin and Drever 2017).

[j] I counted 61 nests and 9 were suspected nests behind the girders.

4.1.1. Phenology of Double-crested Cormorants on Span 2 of the Ironworkers Memorial Bridge.

There were nesting cormorants on all 10 sections of Span 2 on the Ironworkers Memorial Bridge. Cormorant nesting activities occurred on the bridge's lateral bracings that were positioned horizontally, diagonally, lower diagonally, and vertically. Red middle beams in Figure 4-1 (also see Appendix C and Appendix F) correspond to the lateral bracings where all nests were found. However, not all lateral bracings were equally attractive for nesting cormorants. Sections 4 through 7 in Figure 4-1 were most preferred locations as these sections recorded higher densities of Double-crested Cormorants. These sections were at the centre of the colony whereas the other sections are at the periphery of the breeding colony and recorded a lower Double-crested Cormorant density.

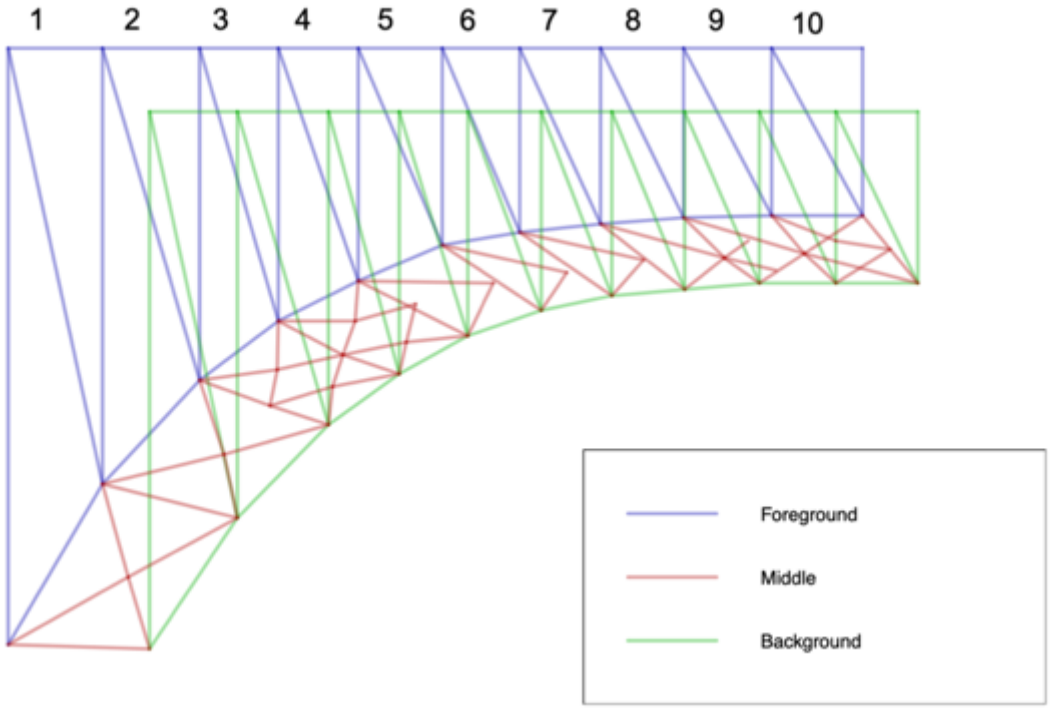


Figure 4-1. Schematic diagram of Span 2 of the Ironworkers Memorial Bridge in Vancouver, British Columbia. All Double-crested and Pelagic Cormorant nesting activities occurred on the middle beams. The middle section was divided into 10 separate sections (labelled from 1 (lowest; left-most) to 10 (highest; right-most)). There is a total of 53 bracings (in red). Each bracing is labelled with a unique ID, that starts with a section number (1 through 10).

I started my field season at the north side vantage point of the Ironworkers Memorial Bridge on May 27, taking my first GigaPan image on June 2, 2020. However, from my series of images, it is clear that June 2 is well before the breeding peak for both Double-crested and Pelagic Cormorants. Population counts for birds, nests, and chicks that peaked between late June and mid-July for nesting Double-crested Cormorants (Figure 4-2), where a maximum number of 182 Double-crested Cormorants, and 168 nests were counted on July 3.

As field work began later than anticipated in 2020, there were already chicks hatched in nests, and starting in late July, the Double-crested Cormorant juveniles started to fledge and did not return. The GigaPan image sequence found the final chicks fledged in mid-September. An image on September 25 recorded only a single Double-crested Cormorant left on the bridge. There were no Double-crested Cormorants after October 2, 2020 (Figure 4-3).

Table 4-2. Full Double-crested Cormorant population and nest counts on July 8 and 10, 2020 show the peak nesting activities on the Ironworkers Memorial Bridge in Vancouver, British Columbia.

Ironworkers Memorial Bridge	Nests	Birds	Image Date
Span 0	0	0	Friday, July 10, 2020
Span 1	129	189	Friday, July 10, 2020
Span 2	167	244	Wednesday, July 8, 2020
Span 3	0	0	Friday, July 10, 2020
Span 4	0	0	Friday, July 10, 2020
TOTAL	**296**	**433**	

Nest disappeared (i.e., fell off or were removed) from lateral bracings of the Ironworkers Memorial Bridge from mid-July onwards. There was an approximate 70 % disappearance of the nests across 10 months of sampling between the peak number counted on June 10, 2020 and March 5, 2021. As shown in Figure 4-4, there were still a number of nests present on the central sections in March 2021 (including the ‘central’ Sections 3, 4, 5, 6, and 7).

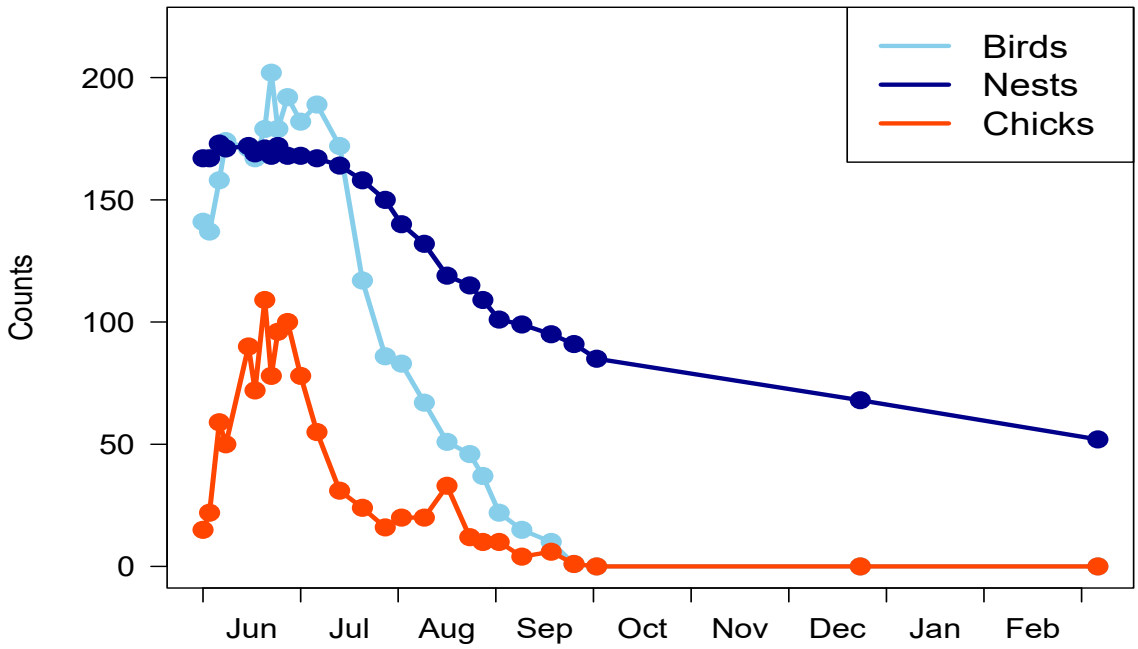


Figure 4-2. **The maximum and sharp decrease in the Double-crested Cormorant population count shows a peak in bridge use between late June and mid-July on Span 2 of the Ironworkers Memorial Bridge in Vancouver, British Columbia.**

4.1.2. Nest-site Selection of Double-crested Cormorants on Span 2 of the Ironworkers Memorial Bridge.

The lowest horizontal bracing with nests is 18.6 m above water, while the two highest nesting locations locating at 35.6 m and 34.6 m above water. By comparing nest density across different heights of lateral bracings, cormorants exhibit nesting habitat differentiation on Span 2 of the Ironworkers Memorial Bridge. This is evidenced by the darker colored red on more centrally located sections from Sections 2 to Sections 7 (Figure 4-4).

There were differences in the breeding phenology across birds nesting on different sections of Span 2. In Figure 4-5, the vertical solid line shows that Double-crested Cormorant nests on the lower lateral bracings from Sections 2 through 4 reached peak breeding activities on July 15. This implies that chicks fledging began on July 15 because not many birds remained in nests after that.

Comparatively, the area between the solid and dotted lines in Figure 4-5 show peak nesting activities on the higher lateral bracings of Sections 4 through 7 occurred later, between July 22 and August 24. This implies chicks from higher nests had chicks that fledged later in August compared to the lower nests.

Nests are at an equidistance from one another as the average distance of two cross beams measured on a lateral bracing is 1 m. This assumes the nest site competition between two nesters, where, when too close, both breeding pairs will result in intraspecies egg or chick depredation.

In addition, results also show that juvenile cormorants nesting occurred, but nest resilience did not persist. This may suggest that juvenile birds in immature plumage may have been practicing nest construction, which was also recorded by Sazima (2008). Figure 4-5 also shows significant evidence of nest disappearance after the chick fledging dates, especially nests that used to occupy the edges of the colony. Double-crested Cormorant nests at the lower periphery (2H1), and at the upper periphery (9H1 and 10V1A) disappeared 16 and 10 days after the first sampling date of June 3, 2020. As these dates are too soon to successfully fledge young, this suggests fitness of nesting birds may be lower at the edge of the colony or nest hatching occurred in May that almost two weeks after the first sampled date, the chicks were readied and fledged.

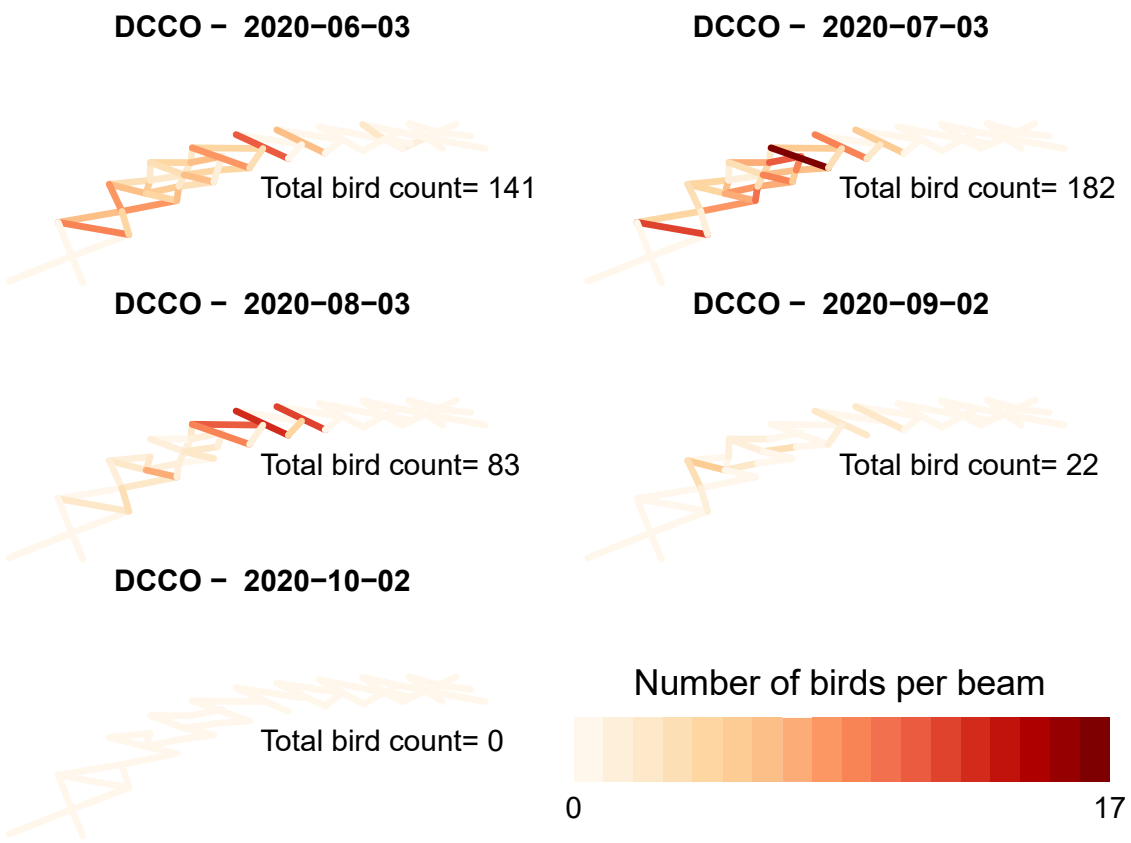


Figure 4-3. **Bird population count on Span 2 of the Ironworkers Memorial Bridge in Vancouver, British Columbia shows the significance of the central locations as an important breeding site for the Double-crested Cormorants in June and July 2020. Nests were distributed across Sections 2-7, and nests gradually disappeared from July. Blank, or missing beams indicate that no birds were present.**

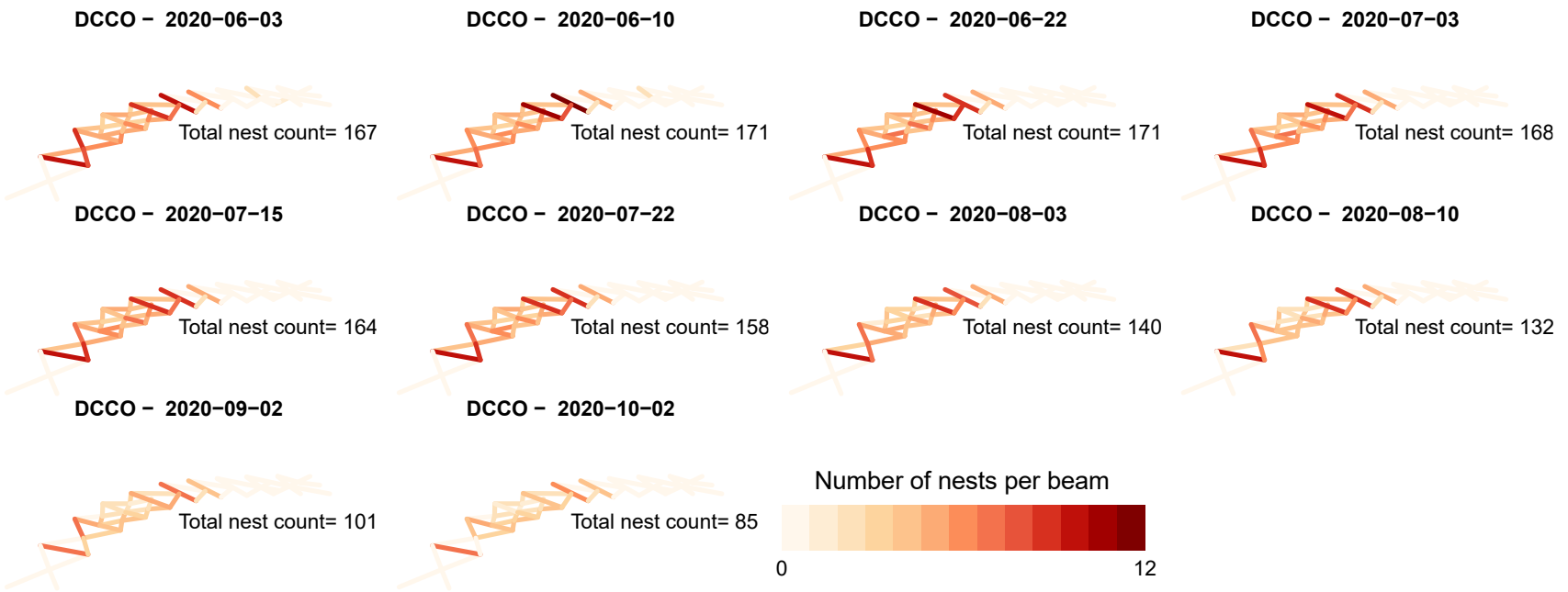


Figure 4-4. Double-crested Cormorant nest distribution on Span 2 of the Ironworkers Memorial Bridge in Vancouver, British Columbia shows a 70 % of nest disappearance from June 10, 2020. Nest disappearance followed a central-periphery distribution where more nests on edges of the colony fall off from June 2020 to March 2021. Blank, or missing beams indicate that no nests were present.

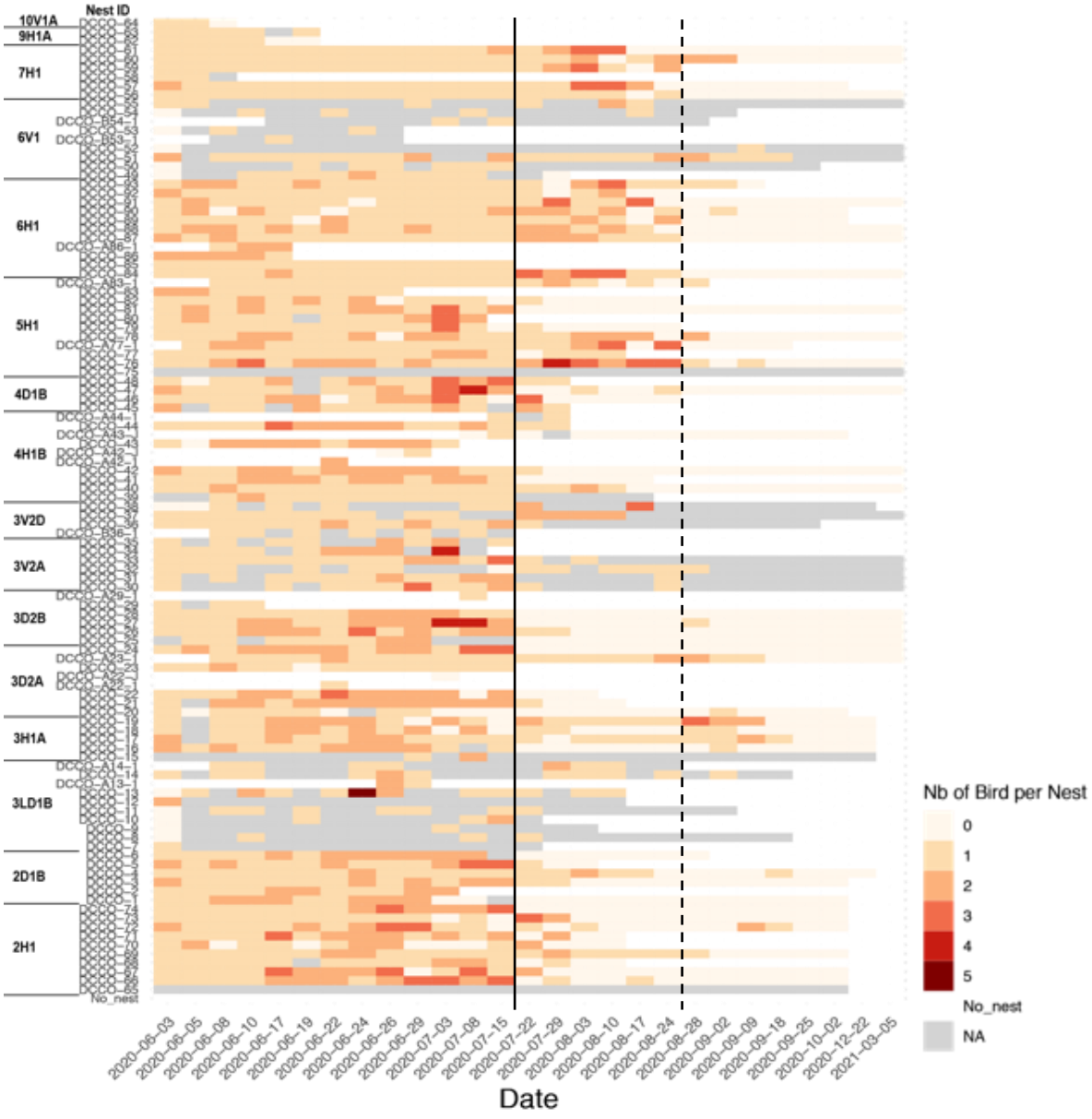


Figure 4-5. **Heat-map distribution on Span 2 of the Ironworkers Memorial Bridge in Vancouver, British Columbia shows two different Double-crested Cormorant nest occupancy trends and chicks fledging ranges. Sections 4-7 are the high and central location with high cormorant density whereas other sections are the periphery with lower cormorant density. Lower nests reached a maximum population count in mid-July whereas higher nests had a later breeding activity in August. No_nest corresponds to 1D1A, 2LD1B, 6D1, 8D1A, 8V1, 9H1B, and 10H1A. J represents juvenile cormorants; A and B correspond to cormorant whose nests come after or before the previously labelled nest. Solid line shows lower nest fledging and dotted line shows the higher nest fledging.**

4.1.3. Phenology of Pelagic Cormorants on the Ironworkers Memorial Bridge.

The first cormorants to return to their nest sites in spring of 2021 were Pelagic Cormorants. On March 17, 2021, I counted five Pelagic Cormorants returning to potential nest sites on Span 3 of the Ironworkers Memorial Bridge. The highest number of Pelagic Cormorant nests from my image analyses suggested maximum occupancy occurred in August (Figure 4-6).

Table 4-3. Full Pelagic Cormorant population and nest counts in July show the peak nesting activities on the Ironworkers Memorial Bridge in Vancouver, British Columbia.

Ironworkers Memorial Bridge	Nests	Birds	Image Date
Span 0	0	0	Friday, July 10, 2020
Span 1	8	4	Friday, July 10, 2020
Span 2	6	5	Wednesday, July 8, 2020
Span 3	35[a]	29	Friday, July 10, 2020
Span 4	12	5	Friday, July 10, 2020
TOTAL	**61**	**43**	

[a] 61 nests were counted and 9 were suspected nests behind the girders.

Nest numbers quickly decreased after the beginning of September, likely coupled with the fledging of young. This is not because there were no successful nests, it is because on the bridge Pelagic Cormorant nests mostly occurred on the inner girders or at the corners where brightness became a limiting factor, or very high up (at bad camera angles). The opaque nest material of Pelagic Cormorants made it additionally challenging to see these birds. However, these locations would also be difficult to monitor using traditional survey methods if light limits the ability to observe the nests.

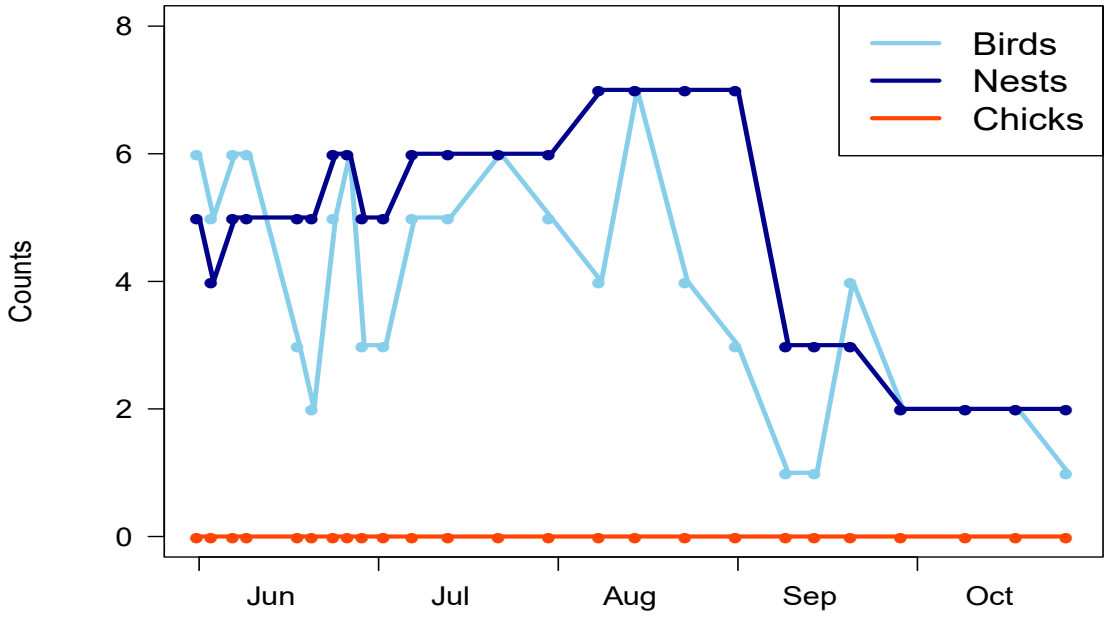


Figure 4-6. Pelagic Cormorant maximum nest occupancy on Span 2 of the Ironworkers Memorial Bridge in Vancouver, British Columbia occurred in August. Bird and nest numbers decreased subsequently. No chicks were observed in the GigaPan images due to obscuring from opaque nest materials. Nest number was zero on March 5, 2021.

My GigaPan results present one limitation of the digital sampling tools because no Pelagic Cormorant chicks were observed from image analyses (Figure 4-6). This is because Pelagic Cormorant nests mostly occur on the inner girders or at the corners where brightness becomes a limiting factor. However, it could be argued that the sampling tools are still effective in capturing an accurate population count.

4.1.4. Nest-site Selection of Pelagic Cormorants on the Ironworkers Memorial Bridge.

Pelagic Cormorants on Span 2 selected sites that were lower and closer to the water than that of Double-crested Cormorants. Similarly, number of Pelagic Cormorants and their nests constantly decreased after the peak population count on August 3, 2020 (Figure 4-7 and Figure 4-8).

Pelagic Cormorants generally nested at the periphery of the Double-crested Cormorants colony, i.e., 7 nests below the Double-crested Cormorant colony on Span 2, and 37 nests could be found above the water on bracings on Span 3. Pelagic Cormorant nests were built across a broad range of heights from 13.6 m on Span 2 up to 34.7 m above the high-water mark on Span 3. The highest Pelagic Cormorant nesting occurred on the second section of Span 3 at 34.7 m (Appendix G).

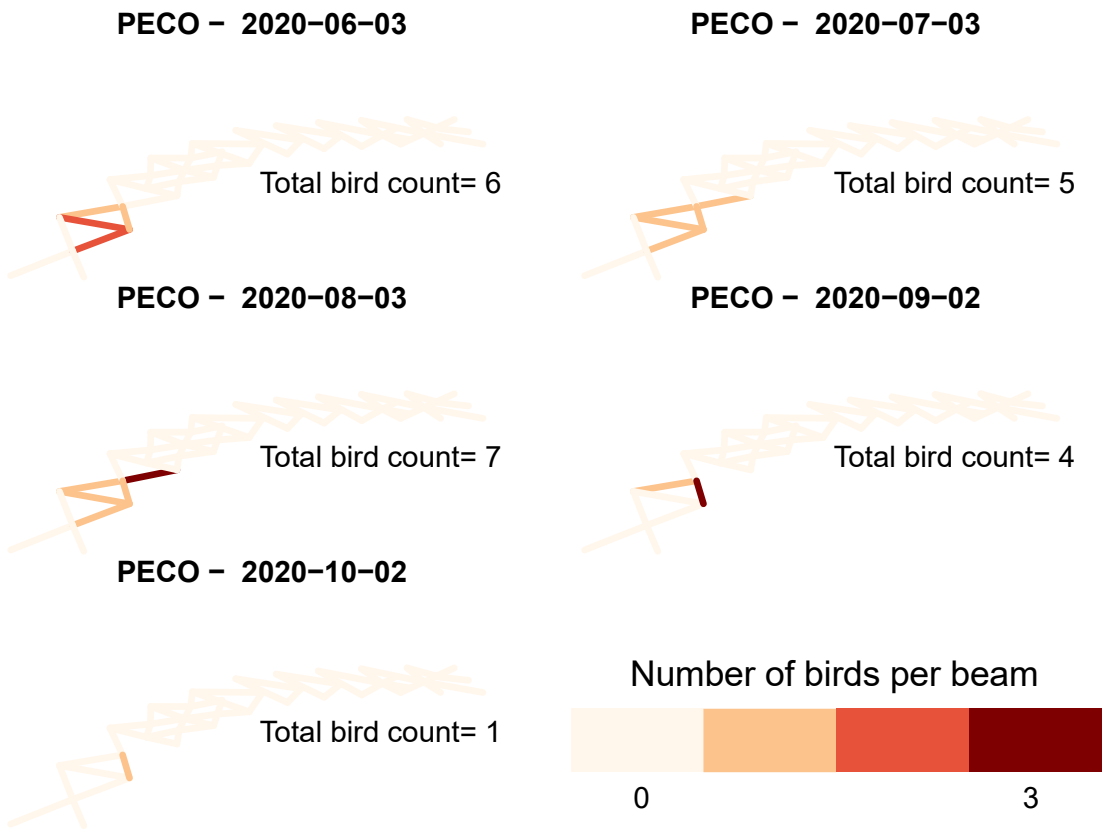


Figure 4-7. Bird population count on Span 2 of the Ironworkers Memorial Bridge in Vancouver, British Columbia shows the Pelagic Cormorants occupied nest sites that were lower and closer to the water in Span 2. Blank, or missing beams indicate that no birds were present.

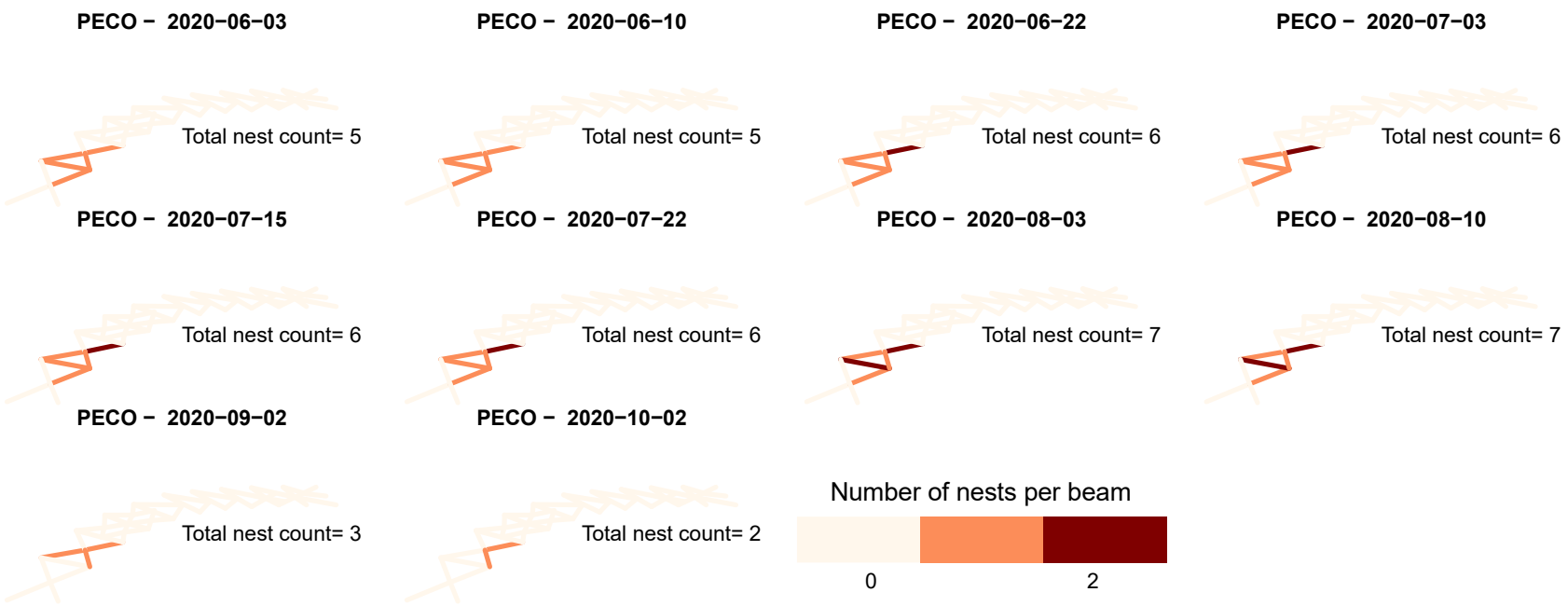


Figure 4-8. Pelagic Cormorant nest distribution on Span 2 of the Ironworkers Memorial Bridge in Vancouver, British Columbia shows a constant decrease after the peak breeding activity on August 10, 2020. The results show a drop from 7 to 2 nests between August and October 2020. Blank, or missing beams indicate that no nests were present.

4.1.5. Viterra Cascadia Terminal.

Sampling was concluded on June 8, 2020 due to equipment failure and building shake. Images from Viterra Cascadia grain terminal were not used in population counts and therefore results show that GigaPan robotic and Sony systems are not effective at this location and vantage point (Appendix L).

4.2. Granville Street Bridge.

Sampling at the Granville Street Bridge on May 11, 2020, recorded 26 Pelagic Cormorant nests. Subsequently on June 13, only 16 Pelagic Cormorant nests were recorded. These numbers are lower than maximum occupancy of the Ironworkers Memorial Bridge because nettings and scaffoldings were installed here. They were bound at all the sections of the bridge that were above water. No nest was recorded on the last visitation on October 7, 2020.

On May 23, 2020, one Pelagic Cormorant was found dead in the netting (Figure 4-9). It was believed that the neck of the cormorant was caught in the netting and unable to escape, died.

Figure 4-9. Granville Street Bridge net caused the death of a Pelagic Cormorant in the breeding season in June 2020.

4.3. Gabriola Island Seacliffs.

4.3.1. GoPro Time-lapse Cameras.

The GoPro time-lapse camera was first installed on a boulder at the foot of Gabriola Island seacliffs recorded 60-second videos, throughout the breeding season until August 15, 2020. Across 99 days of sampling, results show that the equipment recorded video on 89 days but failed to record videos for unknown reasons on 10 days. Cormorants captured in the videos appeared small, and too far away to process the camera's imagery (45 m from the nearest nest). In addition to the distance problem, I found out that the placement of a GoPro time-lapse camera was ill-advised due to the prevalence of guano that regularly covered the lens between rain events.

I installed a second GoPro time-lapse camera on May 23, 2020 that was bolted to the top of the seacliffs, looking downward on the nesting cormorants. Among 84 days of deployment, there were 11 days the equipment did not capture images, at either one interval or both. The reason for this is not known. Therefore, the number of photographs

documented is fewer than the anticipated schedule that was set in the CamDo BlinkX application. This GoPro time-lapse camera was captured 471 photographs in the 64GB storage card at the end of the deployment on August 15, 2020.

The location where the camera was positioned captured 36 nesting Double-crested Cormorants across the 84 days of image captures (Figure 4-10 and Table 4-3). However, when distance increased from the adjacent GoPro Seabird 2, the nests and breeding activities were not able to be recorded in greater depth as the quality was lost upon zooming. Also, nests labelled as 'Others' are not analyzed because of their nesting locations that are obscured by overhangs.

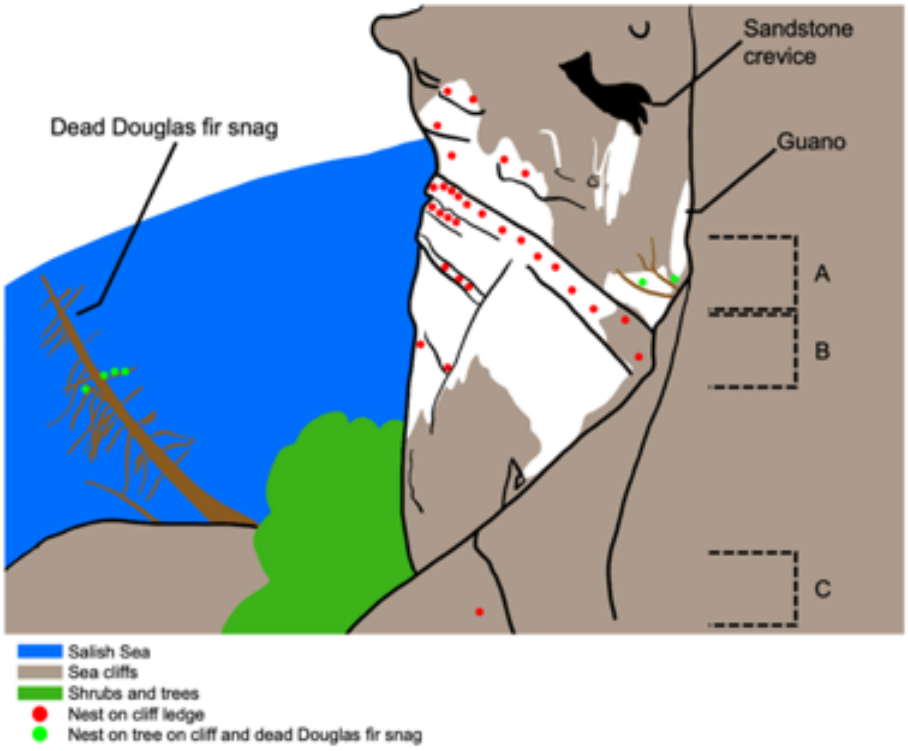


Figure 4-10. Schematic diagram of the location of the GoPro camera (Seabird 2) on Gabriola Island seacliffs that monitored the Double-crested Cormorants nesting on cliff ledges and trees. The location shows 36 breeding pairs of Double-crested Cormorants. A includes two tree nests; B has 14 nests that were on the longest cliff ledge; and C includes only one nest on the shortest cliff ledge.

Among 36 nesting pairs of Double-crested Cormorants, only 17 selected nests from two nesting attributes, tree and open ledges of cliffs, were visible in enough detail to count adult and juvenile birds (Table 4-4). These 17 nests were given unique IDs and

monitored. The nest closest to the GoPro camera in the foreground (C) was the only nest that was well documented, followed by 14 nests in B, and two tree nesting cormorants in A.

Table 4-4. Number of nesting Double-crested Cormorants on Gabriola Island seacliffs that was captured by GoPro time-lapse camera (Seabird 2).

Red		Green		
Sections B, C	Others	Section A	Dead Douglas fir snag	
15	15	2	4	**Total = 36**

Description of nests in Section B at a farther distance is lost due to image resolution and shadow of overhang. The nests in the foreground had most of their nests exposed to harsh sunlight while the last few breeding pairs had the most cave-like coverage that sheltered their nests. Juveniles in 8-11th nests that were protected by larger overhangs remained longer in their nests.

For example, as seen on nest DCCO-CL2 in Figure 4-11 (from July 12-27, 2020) and from horizontal dotted line in Figure 4-12, juveniles took shelter under the shadow cast by nest DCCO-T2, suggesting that overhangs are important for juvenile cormorants to relieve themselves from extreme thermal events, where Gabriola Island recorded the highest 32.1°C between July 12 and 27, 2020 (Government of Canada 2021).

The subset of Double-crested Cormorants on Gabriola Island seacliffs shows that chicks were grown around mid-July (solid line in Figure 4-12) and started to fledge (dotted line in Figure 4-12) in late July. Apart from partial visual impairment during analysis, however, it is notable that juveniles whose nests sheltered by larger overhangs still revisited their nests after fledging, up to the last day of sampling on August 15, 2020 (Figure 4-12 and Figure 4-13). These observations correspond to the behaviors of birds studied by Fogarty et al. (2017) where overhead covers could benefit birds by providing thermal cover that is also a key in nest success.

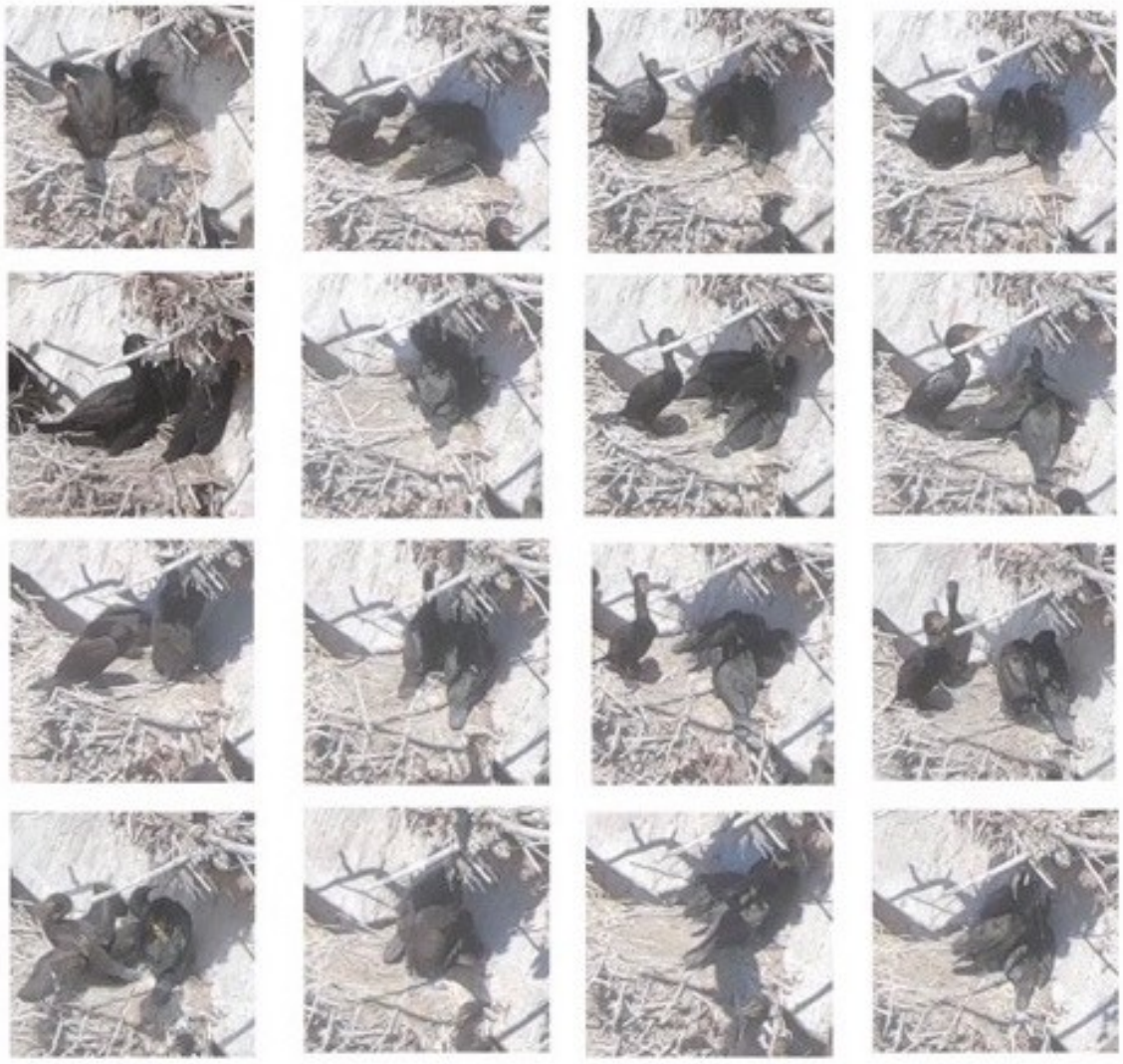


Figure 4-11. Photograph on Gabriola Island seacliffs shows DCCO-CL2 nest occupancy of juvenile cormorants from July 12-27, 2020 where the juveniles took shelter under shadow by facing the cliff because their nest did not have overhang. Time-series chronology on July 12, 2020 starts from left to right. Temperatures between July 12 and 27, 2020 recorded a 32.1°C high and 21.4°C low during daylight hours (Government of Canada).

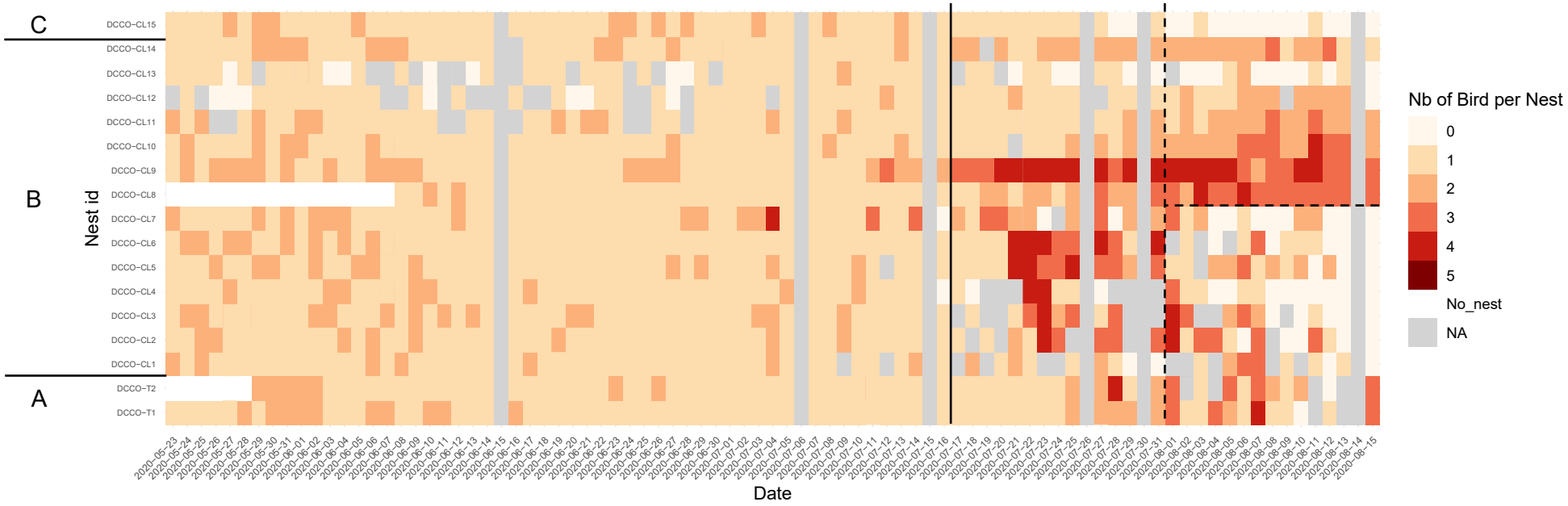


Figure 4-12. Heat-map distribution on the Gabriola Island seacliffs shows farther nests do not achieve an in-depth nest description due to lost resolution, as well as overhang sizes and shadow cast that limit visual inspection. T represents tree nesting while CL denotes cliff-ledge nesting. Solid line shows the putative date of complete chick rearing, dotted vertical line shows the date chicks started to fledge their nests, and horizontal dotted line shows the junevile nest occupancy in nests that had more overhanging protection. Results show that juveniles whose nests had larger overhangs returned to their natal nests after they had fledged, contrarily those who had no nest overhangs did not return (those below the horizontal dashed line).

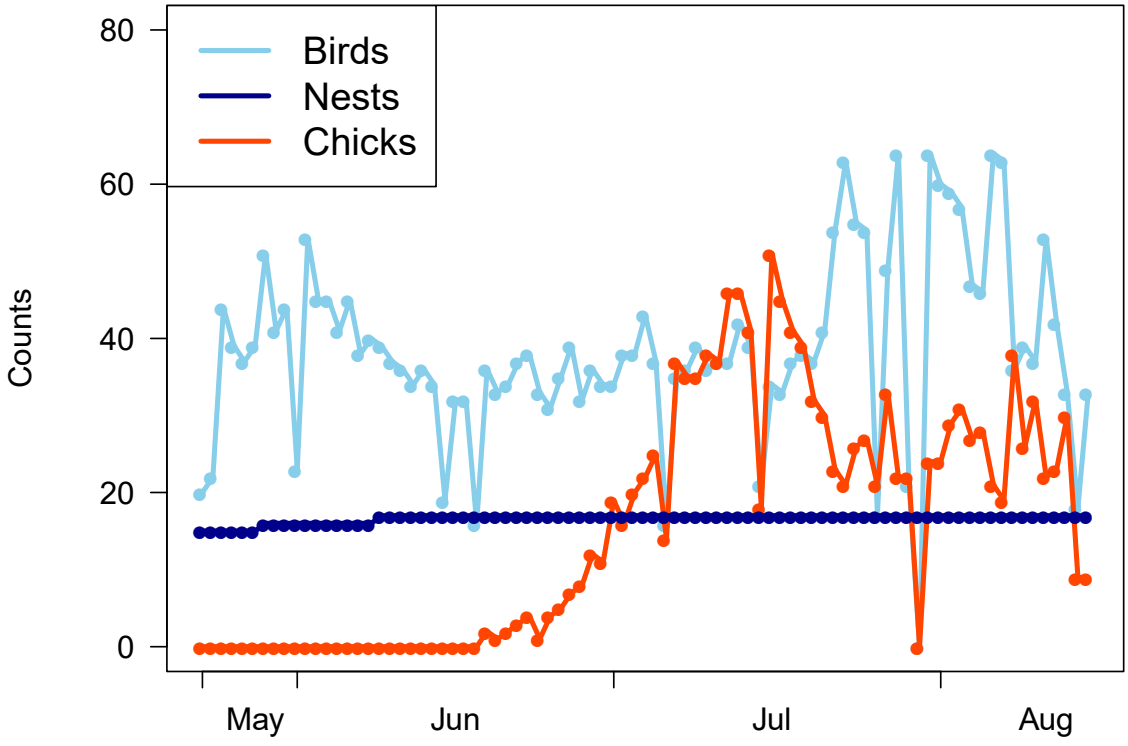


Figure 4-13. Result on Gabriola Island seacliffa shows most chicks started to fledge (and permanently leave) in mid-July. However, from my images I found that juveniles still revisited their nests after fledging even at the end of sampling on August 15, 2020.

4.3.2. Jack Point and Biggs Park.

Cormorant nests were counted from the GigaPan images captured at Jack Point and Biggs Park. Stick nests that were on open ledges on Gabriola Island seacliffs could be observed but the exact cormorant species was not explicitly identified unless white patches were seen on the cormorants, definitively indicating they were Pelagic Cormorants. Consequently, by using the GigaPan images taken from about 1.7 km away from the sample location, only two nests of 269 nests were confidently identified as Pelagic Cormorant nests.

4.4. Comparison of the Robotic System to Traditional Survey Methods.

The GigaPan system was used as a monitoring across the full breeding season and therefore renders a time series of ecologically meaningful images that can be related to a species breeding biology. However, a single GigaPan image can be used to compare the numbers of cormorants from traditional shore-based (at the Ironworkers Memorial Bridge), or boat-based (from kayak at Gabriola Island seacliffs) survey methods.

On July 18, 2020, at the Gabriola Island seacliffs, a single boat-based nest survey was conducted from the water using binoculars. Total nest counts were averaged across the three surveyors for each cliff section. This survey counted 126 active Double-crested Cormorant nests and 64 Pelagic Cormorant nests for a total of 190 nests. For comparison of the two survey methods, I used the GigaPan robotic system from Jack Point and Biggs Park on the same Gabriola Island seacliffs. Using GigaPan Stitch, I counted a total of 269 cormorant nests, a difference of 79 nests, or 29.4 % fewer nests using the boat-based survey method. However, at 1.7 km distance, differentiating between species in the processed images was not possible.

4.5. Image Analyses.

4.5.1. Using Robotic Systems and Cameras as Sampling Tools.

I sampled 114 images at the Ironworkers Memorial Bridge across the 10 months of sampling. Across this set of rendered images, the GigaPan robotic system integrated well with the Sony camera system, and together they are significantly effective. I used two software programs for digital image analyses to resolve the GigaPan images into high-resolution panoramas: (1) GigaPan Stitch v.2.3.0306 and (2) PTGui Pro v11.31. My preferred software program was the GigaPan Stitch, and used the PTGui Pro software only when GigaPan Stitch failed. I calculated the numbers of images that yielded successful and unsuccessful results from the GigaPan Stitch software, and calculated the PTGui Pro success rate on images that where the GigaPan Stitch failed (Table 4-5). It is therefore not possible to compare efficacy between the software performances. Results show that GigaPan Stitch was able to stitch and produce 96 high quality

photographic images out of a total of 114 samplings from all sample sites. This translates to an 84.21 % success rate. On Span 3 of the Ironworkers Memorial Bridge, the GigaPan Stitch software achieved a 100 % success in image processing. For 16 of the images that failed using GigaPan Stitch v2.3.0306, 14 of them were successfully stitched using PTGui Pro v11.31 (Table 4-5). Both software programs returned near perfect results suggesting that results from my digital image analyses are effective and accurate in this study and the system is an effective method to monitor cormorants.

When the GigaPan software failed, I found it was because images lacked control points (i.e., too much sky). The PTGui Pro's feature that was superior to the GigaPan system was that it allowed me to manually adjust the control points of the images. Other reasons behind GigaPan Stitch's failure were still unknown.

Table 4-5. Number of GigaPan images from all sample sites in British Columbia that were stitched and failed to stitch from May 2020 to March 2021. Images were stitched by GigaPan Stitch v2.3.0306 and PTGui Pro v11.31.

Date	No. of GigaPans	No. of PTGui Pros	No. of Failed GigaPans	
May 2020	7	0	1	
June 2020	27	5	1	
July 2020	28	3	0	
August 2020	22	4	0	
September 2020	10	2	0	
October 2020	1	0	0	
November 2020	0	0	0	
December 2020	1	0	0	
January 2021	0	0	0	
February 2021	0	0	0	
March 2021	2	0	0	
Total	**98**	**14**	**2**	**114**

Chapter 5.

Discussion.

The last natural nest site habitat for cormorants within the city limits of Vancouver was located on the basalt cliffs between Prospect Point and Siwash Rock in Stanley Park. This was a breeding colony of Pelagic Cormorants, and it was abandoned in 2000 when a bicycle lane was built along the seawall that increased human traffic to the area (Carter et al. 2014c). Concurrently between 1983 and 2002, the numbers of nesting pairs of Pelagic Cormorants on the Ironworkers Memorial Bridge increased from 10 to 201 (Chatwin et al. 2002) with the numbers peaking in 2014. Double-crested Cormorants seldom nest as a single species, and typically occupy a site once another species of colonial seabird has established themselves at the site first (Wires 2014). Double-crested Cormorants were first recorded nesting at the bridge in 2009, and in 2020, I recorded 296 nests. This has resulted in the Ironworkers Memorial Bridge becoming the largest breeding colony for the Double-crested Cormorants in British Columbia, and therefore an important asset to this vulnerable species.

The motivation for monitoring the cormorants in this study and describing the nest sites they select comes from an inclusive definition of ecological restoration. In my thesis, I interpret it to mean the restoration of the cormorant population, and the breeding sites on which the species depend. Cormorants that nest on bridges have no need for land, conducting all of their biological functions at sea and on the bridge structures where they raise their young. Therefore, my research goals in this thesis are to ensure the ecological function of the bridges continue to support and restore the population of cormorants in the Salish Sea.

5.1. Using GigaPan Robotic and Sony Camera Systems to Monitor the Cormorant Colony on the Ironworkers Memorial Bridge.

Digital sampling methods have been widely used in wildlife monitoring but often limited to small temporal scales monitoring where in the past more studies focused on using handheld or motion-detected cameras (Black 2018). More recently, there are many more robust systematic photogrammetry studies emerging (Pacific Seabird Group 2021). The high-definition photogrammetric sampling method used in this study are new image technologies that have the potential to change the way we monitor wildlife in remote field settings.

The utility of the gigapixel high-resolution camera system has been ground-truthed by Lynch et al. (2015). In this study, researchers in Tasmania, Australia found that 90 % of shy albatross (*Thalassarche cauta*) nests in Albatross Island in Tasmania could be identified from the GigaPan panoramic images over a span of five days (Lynch et al. 2015). Similarly, Australian researchers from the Commonwealth Scientific and Industrial Research Organization (CSIRO) modified a GigaPan EPIC Pro system into a ruggedized autonomous gigapixel system (CRAGS) and deployed it at Chowder Bay in Mosman and Magic Point in Maroubra, Sydney, to conduct studies of human activities on coastal use (Flynn et al. 2016). The expense of the GigaPan system is justified as it negates the issues of erroneous set-ups, especially cameras installed at wrong angles, for example those outlined in Pascalis et al. (2018). My study builds off the success of these deployments, and I found both photogrammetric systems to be efficient, and labor- and cost-effective for investigating cormorant breeding biology including nesting behavior, nest site selection, and nest disappearance in urban and remote breeding colonies. The equipment cost for this pilot monitoring research that included 2 GigaPan systems was approximately 40,000 Canadian Dollars but due to the lack of previous monitoring costs, an exact cost effectiveness between conventional and this photogrammetric method could not be compared.

The photogrammetric sampling tools in this study, including the GigaPan robotic and Sony camera systems, and the GoPro time-lapse camera, were able to provide high spatiotemporal capabilities to census both species of cormorants during their breeding season on the Ironworkers Memorial Bridge. GigaPan and Sony systems have

exceptional image resolution to distinguish individual cormorants at >1,500 m distance. After stitching the resolution is approximately 20 times higher in resolution than the resolution of a photograph from a traditional camera set-up. The technology in this study therefore provides suitable spatiotemporal scales for cormorant monitoring. GigaPan effectively sampled areas between 200 m and 1.7 km for cormorant nesting selection by capturing high-resolution gigapixel photographs (Flynn et al. 2016). However, sampling is data dominant as all images have big data loads (Flynn et al. 2016). My sampling schedules created an average monthly data load between 200 and 600GB, and the study design is a balance between frequency of sampling and image storage capacity. Further details of the GigaPan and Sony systems can be found in the supplementary materials in Appendix E.

Another consideration for the GigaPan system was that a single vantage point for observing the Ironworkers Memorial Bridge resulted in parts of the bridge being obscured by the opaque bracings of such a complex architectural feature. Partly observed nests due to either the bridge, or due to nest material blocking the field of view, increasing the uncertainty of adult and juvenile bird counts. Thus, although the GigaPan robotic and Sony systems are effective as sampling tools, position of the observing system can have important implications in the accuracy and variability of total cormorant counts.

Traditional census methods count all cormorants and do not distinguish nesting adults from non-nesting cormorants. In my study, I chose to focus the GigaPan image analyses only on adult and juvenile cormorants birds associated with nests. Therefore, counts are not comparable between methods in this study. Additional image analyses would be necessary to count all cormorants for the same region to be comparable with all-bird count conducted by shore-based counts. This was beyond the scope of this thesis for the Ironworkers Memorial Bridge survey site. Nonetheless, results still underline the effectiveness and significance of using GigaPan robotic and Sony camera systems in this study.

5.2. Nest-site Selection and Nesting Phenology of Double-crested and Pelagic Cormorants.

Minias (2014) proposed there was an advantage for colonial seabirds to nest closer to the centre of the spatial distribution in a homogeneous habitat in a natural nesting colony. In this study, I constructed time series of nesting cormorants on an artificial human-constructed structure, the Ironworkers Memorial Bridge, and a natural seacliff on Gabriola Island. On the bridge, the possible nest locations are conditional on where suitable habitat occurred, i.e., the lateral bracings, the inner girders, and corners where the bridge's substructures join. I found the highest Double-crested Cormorant nest densities on Span 2 occurred on the more central bridge substructures (between Sections 4 and 7). Hemmera (2019) also reported Double-crested Cormorant nests occurred on the lower lateral horizontal bracings of the bridge.

Nests on the Ironworkers Memorial Bridge that occurred on the periphery of Span 2 were scattered and not resilient, i.e., they fell off or disappeared. This coincides with reports of Lewis (1929) and Mendall (1936) (as cited in Siegel-Causey & Hunt 1981), the geometry of a colony always extends from the centre to the outer edge of the colony. Those cormorants that arrived late or were unable to defend a territory at the centre of the colony were relegated to the periphery due to depleted central nest sites. The Double-crested Cormorants intensify aggression throughout the breeding season until the young reach their maturity (Siegel-Causey & Hunt 1981).

Pelagic Cormorants' defense mechanisms are relatively less aggressive than those of Double-crested Cormorants likely a consequence of their smaller size. Instead, Pelagic Cormorants select more protected nest site structures (Siegel-Causey & Hunt 1981), and lower nest-site location on Span 2. The study at Gabriola Island seacliffs supports the notion of colony heterogeneity, particularly where juveniles in the nest that had no overhead protection like an overhang took shelter under one tree nest shadow for two weeks. Similarly, juveniles whose nests were in a cave like cliff ledge had large overhead protection returned to their nests more frequently and likely received more parental care at the nest site.

In homogeneous habitat, Coulson (1968) proposed that breeding pairs that nest in the central location are physically fitter than the peripheral nesting pairs. For that

reason, nesting densities are usually higher at the centre of the breeding colonies. Minias (2014) also proposed that colonial birds that nest in homogenous habitats are likely to achieve a central-periphery nesting pattern, whereas the pattern will not be followed in heterogenous nesting habitats. Similarly in this study, lateral bracings on the Ironworkers Memorial Bridge provide a trade-off between a homogeneous and heterogenous habitat for the Double-crested Cormorants because the central bridge substructures are consisted of two flat bracings that are crisscrossed by V-shaped cross frames. Relative to the putative advantage of nest sites in trees is that the V-shaped cross beams on the bridge must be strong enough to withstand erratic atmospheric conditions so that nests or chicks do not get washed away (McNeil & Léger 1987). The doubly sized bracing surface provide the Double-crested Cormorants an optimal width to nest on.

As well, central location of a nesting habitat is expected to provide a higher breeding success for colonially nesting birds as a result of decreased predation that causes the loss of eggs and young (Götmark & Anderson 1984; Yorio & Quintana 1997 as cited in Minias 2014; Quintana & Yorio 1998; Minias and Kaczmarek 2013), resulting in predation dilution (Brunton 1997; Brown & Brown 2001 as cited in Minias 2014). It is thus believed that higher fitness breeding pairs with strong reproductive and parental attributes occupied the central locations within a breeding colony and their fitness decreased extending outwards the periphery or edges of the colony. Centrally located nests also provide more protection in terms of detecting and deterring predators (Götmark & Andersson 1984; Elliot 1985 as cited in Janiszewski et al. 2017; Roberts 1996).

A visit to the Ironworkers Memorial Bridge on April 1, 2021, recorded some early arriving breeding Double-crested Cormorants occupying the central location, supporting the notion that early nesters select their nest sites in the centre first. Nest building is initiated by older, more experienced and early nesting cormorants in the breeding season from the centre of the colony, slowly expanding to the periphery by the late nesting and less experienced (i.e., younger aged) cormorants (Janiszewski et al. 2017). McNeil & Léger (1987) and Janiszewski et al. (2017) also found that early arrivers that were of older pairs had higher access to the high-quality nest sites located in the central location of a colony, and that their occupation of the centre colony produced the highest densities of population, supporting the findings in this study, where the central nest sites

on the Ironworkers Memorial Bridge were densely populated in the 2020 breeding season. Similarly, McNeil & Léger (1987) also found that some nests on the periphery of the colony were constructed by younger conspecifics for the first time. Piper (1997) (as cited in Janiszewski et al. 2017) believed that older breeding pairs are more dominant and socially amicable which make them have better access to better nest sites. Studies conducted on Great Cormorants (*Phalacrocorax carbo*) showed that active aggression exhibition such as vocalization and postures (Kortland 1995, as cited in Janiszewski et al. 2017) were assumed to dominate over younger conspecifics that the older individuals were able to secure a high-quality nest site at the early stage of the breeding season within the colony. They were also believed to be more fit to achieve higher reproductive success that is the resultant of better protection at the central colony (Götmark and Andersson 1984, as cited in Janiszewski et al. 2017; Antolos et al. 2006). This results in larger broods, and more fledged young from the breeding pairs in the centre of the colony (McNeil & Léger 1987), while the peripheral nesters have to experience a comparatively higher predation pressure, reducing their reproductive success (Coulson 1968).

Double-crested Cormorants whose nests on the central lateral bracings were equidistant from their nearest neighbours. Some nests at the most central location of Span 2, were more densely occupied along the bracing where they had their closest neighbour at <1 m apart. Siegel-Causey & Hunt (1986) reported nests of Double-crested Cormorants on Mandarte Island, British Columbia, were constructed 0.7 m away from the adjacent neighbor. Peripheral nests, experienced theft pressure of their nesting materials by temporary nest builders. Siegel-Causey & Hunt (1986) asserted that late nesters at the central location had more squabbling neighbors and they exhibited higher antagonistic behaviors and defense strategies from other nest invaders. In this study, the higher density population of Double-crested Cormorants suggests that the centre is between Sections 4-7 on Span 2 of the Ironworkers Memorial Bridge. For that reason, persistence of nests was also strongly associated with the increased nesting density in a breeding colony, which in this study, corresponds to higher Double-crested Cormorant density from Sections 4-7 on Span 2 of the Ironworkers Memorial Bridge that suggests nests are also resilient through the breeding season. When the centre reaches saturation, nesting distribution shifts from the dense nucleus to the ‘pericentral’ for the territorial competition is lower (Siegel-Causey & Hunt 1986), where in this study

peripheral nests at Sections 2, 3, 8, and 9 disappeared when the breeding season progressed into September. Therefore, identifying where the centre of a nesting colony lies will have important implications in the management of bridge safety.

Pelagic Cormorants tend to nest in smaller groups, where small colonies (<50 nests) are common from Alaska through California (Carter et al. 1984). Pelagic Cormorant nest sites usually occur with upper overhead protection (Hobson 2013). On the Ironworkers Memorial Bridge, Pelagic Cormorants nested only at locations with overhead covers, including corners where two bracings meet, above piers, or in the 'upper chords' (Hemmera 2019). This preference for dark corners made it hard to monitor the occupancy of young at these nests. Pelagic Cormorant nests were built across a broad range of heights from 13.6 m above the high-water mark on Span 2, up to 34.7 m on Span 3, and as high as 37.8 m on the Granville Street Bridge, the highest suitable habitat on both bridges. Similar plasticity of Pelagic Cormorants was reported in Hobson & Wilson (1985) where substructures of the bridge that are narrower provide a minimum width and are therefore much more preferred as nest sites.

Pelagic Cormorants generally nested at the base of the Double-crested Cormorant colony (7 nests), or on the bottom flanges of the bracings on Span 3 (37 nests), i.e., at the periphery of the lateral bracings occupied by the Double-crested Cormorants (considering Span 2 is the core centre). This might be due to the nest site competition between both cormorant species but may also reflect the higher tolerance of Double-crested Cormorants for exposed nests that do not have nest covers. This spatial separation observed in 2020 is consistent with what has been already reported for the Ironworkers Memorial Bridge (Hemmera 2019). Historically the numbers of Pelagic Cormorants were as high as 256 (Carter 2014a, b; Carter and Drever 2016; Halpin & Drever 2017) for this bridge with no (or little) competition from Double-crested Cormorants. To my knowledge, there is no existing photos of the nesting Pelagic Cormorants from this period to see if this species was confined to the peripheral substructures of the bridge, or occupied the real estate that now hosts Double-crested Cormorants.

Double-crested Cormorants construct stick-like nests (Rauzon et al. 2001; Moul & Gebauer 2002; Van Damme & Colonel 2007), while Pelagic Cormorants nests are more heavily coated with their excrement (guano) and more cemented to the nest

substrate. For this reason, Pelagic Cormorants are able to nest on narrow flanges than other cormorant species (Siegel-Causey & Hunt 1981). Hobson & Wilson (1985) highlight the high plasticity of Pelagic Cormorants to use inner girders, flat flanges, and bottom flanges of the bridge substructures compared to Double-crested Cormorants that usually nest on broader platforms (Siegel-Causey & Hunt 1981). The narrow and more secured topography of the L-shaped substructures on the Ironworkers Memorial and the Granville Street Bridges provided sufficient width for the Pelagic Cormorants to nest on up to 40 m above water level.

Evidence on nest disappearance pattern is scarce, but this study discovers nests were disappearing at the periphery before those at the centre, supporting the evidence of central nests are more resilient. By comparing nest disappearance of Double-crested and Pelagic Cormorants on Span 2, nests were gradually dismantled or disappeared abruptly after the cormorants' optimal habitat use on the Ironworkers Memorial Bridge. Similarly, there is also a significant nest disappearance on Span 3, indicating a 100 % nest disappearance (Figure 5-1). Other reasons behind nest disappearance are otherwise not known. There may be other reasons behind nest disappearance such as destructive competition by rivals, or by juveniles. As this behavior was not observed, it is not clear how nests disappeared.

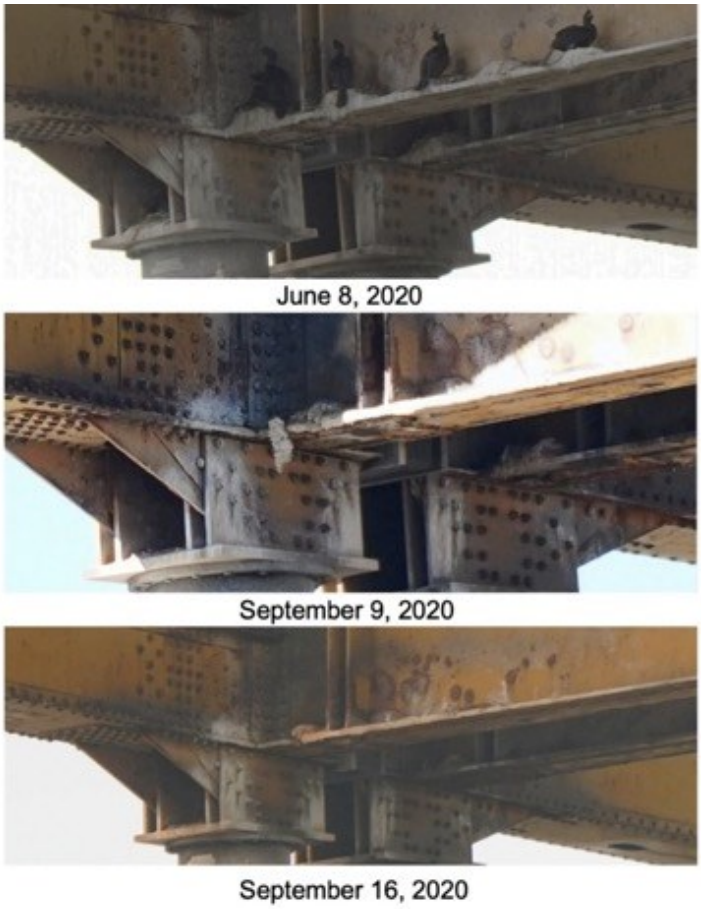


Figure 5-1. Pelagic Cormorant nests on Span 3 disappeared (fell off, dismantled, dislodged, or removed) when the breeding season progressed.

5.3. Granville Street Bridge.

Between November 2019 and February 2020, the City of Vancouver installed 'avian exclusion netting' on the Granville Street Bridge in anticipation of seismic upgrades to the bridge. Over the early breeding season, until the netting was fully secured, cormorants were able to still bypass the netting (Hemmera 2021). Unfortunately, multiple Pelagic Cormorants were found dead before the netting was fully secured (Figure 4-9). The netting was eventually tightly bound at all the sections of the bridge, and no further cormorants were caught in the netting.

I used the GigaPan system from a single vantage point to sample at the Granville Street Bridge. On May 11, 2020, I recorded 26 Pelagic Cormorant nests. Subsequently

on June 13, only 16 Pelagic Cormorant nests were recorded. Surveys by Hemmera conducted on October 8, 2020, used multiple vantage points, and surveyors were equipped with binoculars and a spotting scope. A total of 73 Pelagic Cormorant nests were counted (Hemmera 2021). However, on October 8, 2020, 66 Pelagic Cormorant nests no longer remained (fell off, or removed) on the Granville Street Bridge (Hemmera 2021).

Netting and scaffolding blocked nesting on all of the Granville Street Bridge except for the top flange (i.e., most of the bridge was blocked: Figure 3-5). Despite the netting and scaffolding, Pelagic Cormorants built their nests around the nettings at the bottom flanges of the girders (Figure 5-2). Pelagic Cormorants were nesting up to 37.8 m above high-water mark on the Granville Street Bridge, and on Span 3 on the Ironworkers Memorial Bridge, nests were similarly constructed between 31 and 34.7 m above the high-water mark.

Figure 5-2. Nest-site selection at the Granville Street Bridge is similar to that of Span 3 of the Ironworkers Memorial Bridge, including intersections of bottom flanges.

5.4. Survey Methods at Gabriola Island Seacliff Cormorant Colony.

5.4.1. Traditional and Photogrammetric Survey Methods.

A single traditional cormorant survey using boat-based methods with binoculars was conducted on July 18, 2020. Despite a clear sky, strong northwesterly winds and high waves added additional risks in counting cormorant nests along the Gabriola Island seacliffs. The poor vantage from the kayak below the seacliffs was a factor that affected the survey. Much of the sandstone cliff had pock-marked features and many crevices ideal for nesting cormorants while also making it a highly heterogenous nesting site. Describing nest-site selection between the two species of cormorants at this highly featured seacliffs was beyond the scope of this study, but would be a valuable focus of further research.

The Gabriola Island seacliffs run several hundred metres long. Across the length of the seacliffs, not all cormorant nest sites were equally exposed to sunlight while some were shaded by shadow from the sandstone pockets and crevices. For that reason, it was quite challenging to get an accurate count. We followed the method for which nest sites that had stick materials were first counted, and then scouted for nests that did not have stick materials or hidden in the sandstone crevices.

The stitched GigaPan image taken in June of the Gabriola Island seacliffs from Jack Point and Biggs Park reported 79 more nests than that reported in my traditional boat-based count in July, i.e., 29.4 % more nests. This suggested either that nests were abandoned or emptied due to the young fledging between the June and July counts, or, more likely, the GigaPan was better at getting an accurate cormorant count of both cormorant species. Since the GoPro monitoring documented the first fledged cormorants left the nest only at the end of July, it is unlikely that any young had fledged and left the nest by July 18, 2020 in which the time the traditional survey was conducted. This suggests that using the high-definition photogrammetric GigaPan robotic system was better and able to count nests despite a distance of 1.7 km across Northumberland Channel to the colony from the camera location. The traditional boat-based method was better able to distinguish species of cormorants, which was not possible from Jack Point and Biggs Park due to the heterogenous cliff habitat that blended the birds' features with

the nests of both Double-crested and Pelagic Cormorants (Figure 5-3, Figure 5-4, and Figure 5-5).

Figure 5-3. GigaPan Stitch snapshot of breeding cormorant colony in Gabriola Island that was taken at Jack Point and Biggs Park that is 1.7 km distance across Northumberland Channel. Heterogeneity of the Gabriola Island cliff habitat blended the cormorants' features with their nests.

Figure 5-4. Pelagic Cormorants nesting on lower cliff ledges and sandstone holes. Their heterogeneous nest sites made it difficult for observer to definitively identify them from 1.7 km away.

Note: Photograph by Trudy Chatwin., 2020

Figure 5-5. Double-crested Cormorants nesting in sandstone holes. The camouflaged nest sites made it difficult for GigaPan to identify the definitive cormorant species from 1.7 km distance.

Note: Photograph by Trudy Chatwin, 2020

High-resolution camera systems are able to provide a larger field of view with competent resolution in the images to assess population numbers (Robertson et al. 2008), breeding phenologies, parental nest attendance, and juvenile survival (Edney & Wood 2020). As well images can be taken from farther away than survey methods that are dependent on human eyes. As science progresses with more advanced digital imaging technologies in tandem with machine learning algorithms for processing the images, observer- and boat-based census will increasingly become more outdated. Traditional census methods are cost- and time-intensive and do not provide permanent records for future assessment. Records from fixed vantage points provide photographs and videos for digital sampling, and can often render additional information that might have been missed during the original capture, something that is not possible using traditional boat-based colony counts (Hutchinson 1980). Camera digital records can be zoomed into detailed views during analysis (Thaxter & Burton 2009; Kemper et al. 2016), and post-processing of images can improve image quality and consistency (Hutchinson 1980; Wilhelm et al. 2015). However, the improved data quality of digital imaging technologies must be balanced with the purchase and operational costs (Hutchinson 1980) as well as the considerable time it can take to train a technician to use these

technologies and to use the digital sampling tools for post-processing the images from the field.

5.4.2. GoPro Time-lapse Camera Systems.

The utility of time-lapse photography has been markedly used in ornithological studies with the advancement of technology (Dodge & Snyder 1960; Green & Anderson 1961; Cowardin & Ashe 1965; Temple 1972; Weller & Derksen 1972; Harris 1982; Huffeldt & Merkel 2013; Merkel et al. 2016; Hinke et al. 2017; Pascalis et al. 2018). Time-lapse cameras take continual photographs or videos of subjects at pre-set intervals (Cutler & Swann 1999) depending on the user and their project goals.

In its variety of forms, this study deployed fixed time-lapse cameras known as GoPro to study the breeding behaviors of a subset of Double-crested Cormorants on the Gabriola Island seacliffs. These cameras captured the presence of the cormorants at one fixed vantage point across the monitoring period (Cutler & Swann 1999; Black 2018). One fixed time-lapse camera proved to be suitable at collecting time-series data such as breeding behavior and nest attendance and provided various advantages against the traditional boat-based fieldwork. It increases the effectiveness by reducing the observation costs, time investment (Walsh et al. 1995; Edney & Wood 2020), and money on the need to travel to locations that are inaccessible and exposed to inclement weather (Walsh et al. 1995). In addition, time-lapse cameras can capture irregular events ‘not purposefully monitored’ (Harris 1982; Black et al. 2017). Infrequent camera installation outside breeding season and maintenance and stationary time-lapse cameras will increase the feasibility of recording higher temporal range of data, and effectiveness particularly in remote locations that have unfavorable weather conditions (Weller & Derksen 1972; Black et al. 2017; Black 2018; Pascalis et al. 2018).

Relative to GigaPan, GoPro time-lapse cameras have smaller data load because of the lower resolution images. However, GoPro time-lapse cameras are likely to result in data loss from mechanical failure. For example, both GoPro cameras’ BlinkX time-lapse schedules did not function as they looked on the template on the application. That is the reason both cameras recorded fewer images and videos. The start date and end date were to line up with end date and end time. There were also intermittent days that the GoPro equipment did not record any images or videos. The reason for these

missing images is still unknown despite thoroughly testing the system before field deployment. These failure occurrences correspond to what Merkel et al. (2016) reported, i.e., it is difficult to predict the mechanical failures of digital imaging technologies, including time-lapse cameras. However, these technologies are advancing and in this study, these cameras' failures did not affect the cormorant monitoring on the Gabriola Island seacliffs.

Similar to what Edney & Wood (2020) report, resolution reduction and loss will increase when the distance of colony from the camera increases which it will further degrade the image resolution. Images taken from the Gabriola Island seacliffs colony had to deal with a substantial amount of resolution loss but are manageable to produce a near-perfect baseline data. In terms of time, cost, and labor investment, fixed position time-lapse cameras are a great tool for monitoring seabirds. Nonetheless, together with many studies conducted by Merkel et al. (2016), Black et al. (2017), Hinke et al. (2017), and Pascalis et al. (2018), time-lapse cameras in this study were effective in monitoring cliff ledge nesting cormorants.

These limiting factors however do not diminish the capabilities of a time-lapse camera in monitoring 17 in-depth cormorant behaviors and activities, including nest occupancy and fledging of juveniles. It is evident that GoPro time-lapse camera and visual inspections are 94.61 % effective and efficient in capturing cormorant behaviors, notwithstanding equipment failure. Both GoPro time-lapse camera, and GigaPan robotic and Sony systems have different variabilities and flexibilities in monitoring cormorants when placed in different vantage points (i.e., below or above) that will determine if the camera has a good angle. However, the GoPro time-lapse camera system is superior over the GigaPan and Sony systems in remote monitoring as it is a hands-free monitoring method. However, the GigaPan and Sony superior magnifying view of the breeding Double-crested Cormorant colony means sampling can occur much farther away at sampling locations with open access.

5.4.3. Manual Image Analyses.

Manual digital image analyses are comparatively time-consuming, physically straining, and might render observational errors and biases from computer fatigue if observers are not trained in the field. However, data captured from all digital sampling

tools in this study produce readily accessible permanent records that allow observers numerous opportunities to magnify repeatedly to ensure data are accurate (Edney & Wood 2020). Desktop analysis can also occur after the fact independently without the influences of external environmental elements (Edney & Wood 2020) on field observers, where direct observation might lead to errors and biases. However, the image accuracy is also dependent on the intrinsic ability (Edney & Wood 2020) of the observer to correctly derive data from the images. The field assistants in this study are trained and skillful in identifying the studied species and their features, and all image analyses were done on the brightest digital screens (Sinclair et al. 2017), including laptop and tablet. Digital technology undoubtedly increases (1) accuracy, (2) cost-, time-, labor-effectiveness; expands (3) data scale range and capabilities; and reduces human-wildlife disturbance. Relative to data collection, one trade-off is data loads in digital imaging technologies that will further constrain the cost and labor in handling images and image resolution, which will eventually affect the outcome and accuracy of the data. Image resolution mainly depends on the choice of camera that are not only limited to the pixel resolution and lens optical quality, but also the in-camera features. For example, Sony α7R IV 35 mm full-frame camera with 61 million pixels is a choice of camera in this study because of its overwhelmingly capable low light performance coupled with high ISO against other camera makers. This study had the opportunities of deploying one of the state-of-the-art digital imaging technologies in studying cormorants, where, in some circumstances digital imaging products are dependent on the amount of funding (Waldron et al. 2013) that are available for the research.

It is recommended to install time-lapse cameras at a downward vantage point to capture a broader interest of subjects with the least obstruction in the field of view. However, lens being coated with cormorant excrement is inevitable and due to infrequency of human visits, one element that will reduce those occurrences are precipitation on Gabriola Island across the studied period. Another disadvantage of laborious image analyses is time investment when images become unmanageable. This is because the amount of imagery can quickly surpass the ability of the observer's processing abilities (Pascalis et al. 2018), which will further lead to more labor-intensive processing from more individuals and reduce cost effectiveness. Image analyses of 471 GoPro time-lapse photographs took four days to complete. With an increasing number of

photographs taken by the time-lapse cameras, it will also increase the need to visit the location to retrieve and replace memory storage cards to prevent image flooding.

5.5. Why are Man-made Bridges Important? Approaches to Conservation and Management Options.

Adkins & Roby (2010) report that the Double-crested Cormorant is perceived as a pest across much of Canada and the U.S. due to their tendency to nest in concentrated numbers (Wires 2014) and their perceived effect on sport fisheries. As I found out by installing a camera under the Gabriola Island seacliffs, cormorants produce a copious amount of acidic guano that coats everything within striking distance, and this can damage or kill the vegetation at nesting sites. In the U.S., depredation orders since 1998 have resulted in the culling of >500,000 Double-crested Cormorants (Wires 2014). Currently, legal control measures, including organized culls, issuance of take permits, and/or designated hunting seasons, are in effect in most of the central and eastern provinces (Keith 1995). During the fall of 2020, anyone with a shotgun and a hunting license could kill up to 15 Double-crested Cormorants a day (Bell 2020; Cotnam 2020). In Manitoba, thousands of cormorants are killed illegally while in Quebec, a more lethal control involves a cormorant cull (Moul & Gebauer 2002). Similarly, while cormorant hunting seasons are in effect in New Brunswick and Prince Edward Island; fishermen in Nova Scotia and Newfoundland are permitted to kill cormorants (Moul & Gebauer 2002).

Despite the cormorant's reputation, in British Columbia there has been no such lethal controls of adult birds by hunters, yet the Double-crested Cormorant numbers are still declining (Moul & Gebauer 2002). As seen elsewhere, large nesting populations conflict with management considerations in many organizations and agencies who are trying to manage their impacts on properties and resources (Strickland et al. 2011). This further prompts the need for cormorant conservation that follows ecologically protective approaches (Moul & Gebauer 2002).

In the past, the Ministry of Transport and Infrastructure (MOTI) actively removed Pelagic Cormorants nests from the Ironworkers Memorial Bridge. In April 1985, MOTI removed 85 Pelagic Cormorant nests from the Ironworkers Memorial Bridge. When the cormorants renested on the bridge, MOTI removed 70 Pelagic Cormorant second clutches a few weeks later in late April. A third sweep of the bridge by MOTI in May

removed 80 nests. The cormorants' resilience to repeated human destruction posed management implications for MOTI (Hobson & Wilson 1985), i.e., this was an untenable management approach. It was believed that the prime foraging resources in the Burrard Inlet influenced the strong desire to nest here and to attempt re-nesting multiple times despite destruction of their nests (Hobson & Wilson 1985). The conventional thinking at that time was that the Pelagic Cormorant population establishment on the Ironworkers Memorial Bridge ensued from their abandonment of other colonies or over-saturated nesting in their natural colonies (Hobson & Wilson 1985). However, no other significant Pelagic Cormorant nest sites besides those on urban bridges are found on the west side of the Strait of Georgia or within the limits of the City of Vancouver. This highlights that bridges are not overflow sites, but instead provide the only habitat for these breeding cormorants within the city limits. Instead, these bridge colonies are a testament to the resilience of this species to coexist with humans within the largest urban landscape in the province of British Columbia.

In 2021, MOTI remains concerned about the large nesting cormorant population on multiple parts of the bridge fearing that the highly acidic guano of cormorants can weaken and corrode the bridge structures (Huang & Lavenburg 2011). In addition, it is feared that maintenance crews may also be exposed to health hazards related to the heavy coats of cormorant guano on the bridge (Hemmera 2019). To this end, Hemmera (2019) proposed nest exclusions, nettings, and roost deterrents to exclude all cormorants from portions of the Ironworkers Memorial Bridge. The suggested inference that this will not have population-level consequences, and the alternative locations could be established for the cormorants, although no alternatives were suggested. My findings suggest that Sections 2 through 7 on Span 2, and this region must be protected such that no means of exclusion measures should be implemented here as this is the optimal nest locations for this Blue-listed (and vulnerable) Double-crested Cormorants.

Human disturbance endangers cormorants and can cause birds to abandon their eggs and chicks (Carter et al. 1984; Carter et al. 2018), as seen in 1983 at Prospect Point. Therefore, it is important to restrict access to the bridge during the breeding season, including maintenance and inspection works in and around the bridge that will result in disturbance. Work windows on the Ironworkers Memorial Bridge must correspond to seasons where no cormorant interaction is expected. Frameworks proposed by Carney & Sydeman (1999) provide one such approach to prevent

disturbance on breeding cormorants. They advised not to enter the breeding colony and allow visitations only when the young reach their maturity. Similar to existing surveys conducted by Hemmera (2018a, b), my results show that Span 2 houses the highest densities of Double-crested Cormorants during the breeding season.

What is the ecological role of bridges for the breeding Double-crested and Pelagic Cormorants? Since many forms of natural colonies have been altered by anthropogenic change in the already deteriorating natural landscapes, it is crucial to invest in alternate ways of maintaining and restoring bridges both to ensure their safety but also to ensure co-existence with breeding cormorant colonies (i.e., removing nettings). Managing a megastructure like a bridge for safety while also restoring a population of cormorants requires a high level of cooperation between agencies with conflicting agendas. However, it is good and essential that humans can create opportunities to coexist with wildlife, including colonial seabirds like cormorants.

With a changing climate driven by increased wind and weather conditions, an ecologically healthy and important nest site and monitoring program should be established. This is what American Wildlife Biologist, Dan Airola, refers to as an ecologically important bridge and advocates that bridges should be preserved for birds is that “you are forcing them to go somewhere that they have chosen not to be in now, and that is taking a risk” (Cliff 2018; Kim 2018). Bridges for wildlife have become the new norm for city engineers and wildlife enthusiasts.

5.6. Bridge Recommendations.

Numerous studies have shown that cormorants have become more adaptable in using artificial structures, such as transmission towers, bridges (Rauzon et al. 2019), and artificial trees (Meier 1981), as their nesting grounds. Therefore, in future work, understanding nest distribution and the timing of nest disappearance on the urban bridges will provide a support framework for MOTI prior to bridge maintenance.

At the study sites in this study, it is recommended to begin monitoring in March to document the nest site occupancy patterns by early arriving birds. Then, surveys should be undertaken two times more vigorously when the first breeders start constructing nests, and continue imagery recording up to the time where nests are no longer

frequented by cormorants. This is to continuously keep record of the early breeders while monitoring the arrival of late breeders to understand their nest site use – whether late breeders occupy the periphery or still choose to nest among their interjacent neighbors. This will produce enough data to justify Double-crested Cormorants are also nesting central-peripherally on artificial structures.

To maintain the health of the Ironworkers Memorial Bridge, bridge structures can undergo rotating degraded paint removal and recoating treatment following complete nesting as well as before nesting occurs. This study shows a high density of cormorant use of bridge structures at Sections 4-7 on Span 2. According to Ashley KI (personal communication, April 23, 2021), while keeping these important central locations of the Ironworkers Memorial Bridge for the nesting use of cormorants, other sections of the bridge can be alternately screened off to undergo corrosion resistant epoxy paint coating (Miltimore & Fink 2010) that will help maintain the bridge's integrity. After that, sections that are previously treated with epoxy paint coating can be opened for the cormorants and then followed by alternate paint treatment. Not only warmer summer months (Miltimore & Fink 2010) are required for drying the epoxy paint coating, but also ideal for bridge activities to carry on to prevent hazardous crew members safety issues such as slips, falls, and extreme cold weather conditions during colder months in autumn and winter (Miltimore & Fink 2010). Therefore, maintenance and repair works can begin when nesting is complete in August before the autumn and winter where the colder weather will impede bridge activities and pose health and safety hazards. Similar to Miltimore & Fink (2010) recommendation, I would also suggest bridge epoxy paint coating before March 15 to not interfere with the cormorants nesting season.

To further understand the role of nest location in nesting success and nest abandonment relative to the distance of the colony centre should be a priority for better understanding the spatiotemporal use of the Ironworkers Memorial Bridge by Double-crested Cormorants. These can be achieved by implementing the aforementioned recommendations by alternately closing sections of the Ironworkers Memorial Bridge for bridge works while allowing breeding activities to occur simultaneously.

High-definition photogrammetric method has been shown to be useful for monitoring bridge nesting cormorants, but it may also have the power to change

management and maintenance routines, on and around the bridge. When bridge engineers are constrained by safety hazards and adverse weather conditions, using photogrammetry methods may be an appealing alternative. Photogrammetry may permit remote visual inspections prior to sending crew members to the underside of bridges, resulting in an increase in work efficiency. Other bridges in the Metro Vancouver district, such as the Granville Street Bridge and the Burrard Street Bridge, should also be monitored to investigate and understand nest-site selection and bridge use of cormorants as they historically hosted most Double-crested and Pelagic Cormorants (Carter et al. 2018). Similar treatment is also recommended for the Granville Street Bridge and the Burrard Street Bridge to allow for renesting and at the same time complement maintenance and repair works. This treatment will not only allow future research to investigate further cormorant relocation, but also allow the bridges' ecological functions for local cormorant populations to be restored that will subsequently result in an increase of the cormorant population in the Metro Vancouver district.

5.7. Future Research Needs.

A long-term census is an important management component in collecting evidence that will provide more baseline data to understand the Double-crested Cormorant bridge use in terms of nesting distribution and nest disappearance. My findings and observations showed that nests disappeared from the bridge structures in the summer months that were dry and had no precipitation. A long-term monitoring should be undertaken in conjunction with the MOTI's bridge management option that is to understand the cormorants' bridge use so that important bridge structures can be protected (Hemmera 2019), and to investigate the reasons behind nest disappearance.

Cormorants have high metabolic rates and regulate their heat more effectively during lower surrounding temperatures 'below thermoneutrality' and cloudy weather conditions (Hennemann 1982). These nest-site selection characteristics can be measured by installing weather recording instruments (Ashley KI, personal communication, April 23, 2021) like digital anemometers, and light and temperature sensors to collect airflow velocity and direction. This is to investigate whether higher density of cormorants and nests at the central locations of the Ironworkers Memorial Bridge are persistent due to favorable turbulence that helps thermoregulation of cormorants during extreme weather events, or if it's related to behavioural and intra-

specific competition. These data can contribute to a three-dimensional model of Doppler velocity patterns that could aid in understanding nest-site selection.

Fogarty et al. (2017) also proposed atmospheric conditions like wind drags, relative humidity, and precipitation can greatly impact nest-site selection. Increasing global temperatures (i.e., climate change) will eventually impact cormorant nest site selection in an effort to mitigate unfavorable weathers (Fogarty et al. 2017). This will have important implications alongside with bridge works. Understanding these characteristics are key to effective management. On Gabriola Island seacliffs, air temperatures reported at Nanaimo from July 12-27, 2020 recorded the highest 32.1°C and lowest 21.4°C during daylight hours (Government of Canada 2021), however temperatures at the southwest facing cliff may have been warmer. My data suggested that thermal covers are an important nest site selection strategy in cormorants.

To complement the photogrammetric approach to cormorant monitoring, further studies could be implemented to identify individual cormorants to monitor time-series data of nest attendance. For example, cormorants could be live captured and outfitted with Passive Integrated Transponders (PIT) tags for a mark-recapture study (Lorentzen et al. 2012).

Chapter 6.

Conclusion.

This research aimed to identify the best effective method to census breeding cormorants on artificial structures. I compared boat-based methods against high-resolution photogrammetric methods that involved multiple digital imaging technologies. Based on a qualitative analysis of digital imaging processing and analyses in response to both cormorant species breeding biology, it can be concluded that GigaPan robotic and Sony camera systems, and GoPro time-lapse camera systems can justify limitations faced by traditional in-person observations. GigaPan technology made it possible to zoom into specific interest points of the images without losing substantial amount of resolution. While maintaining distance from the cormorant breeding sites by using a telephoto lens, it also minimizes external influences on the cormorant behavior and breeding biology. The results indicate that the technologies deployed in this study provide significant spatiotemporal baseline data for future monitoring. Digital sampling methods in this study are significantly better than traditional cormorant monitoring methods and should be continued as part of a long-term monitoring plan at cormorant colonies, but could also be used in other colonially-nesting species.

By targeting a subset of selected nests, this study aimed to quantify the nest phenology of both cormorant species, and test out Double-crested Cormorant nesting distribution and their successes on the Ironworkers Memorial Bridge in Vancouver, British Columbia. Analyses lead to the following conclusion: high density of Double-crested Cormorants nested on the centre of the Ironworkers Memorial Bridge. Therefore, results suggest that the central locations (Sections 4-7 of Span 2) are ecologically important for the Double-crested and Pelagic Cormorants and special care should be taken in managing bridge maintenance of these sections during the breeding months from April to August.

Future studies should aim to replicate results in a larger subset of nests on the heterogenous habitat of the Gabriola Island seacliffs colony. Finally, this study aimed to investigate the reasons and patterns of nest disappearance on the Ironworkers Memorial Bridge. I showed that peripheral nests disappeared first suggesting that the

disappearance distribution follows the inverse of central-periphery nesting theory. However, it will be important that future research understand the implications between nesting distribution and nest disappearance on artificial structures.

References

Adkins JY, Roby DD (2010) A status assessment of the Double-crested Cormorant (*Phalacrocorax auritus*) in the western North America: 1998-2009. U.S. Army Corps of Engineers, Portland, Oregon.

Adkins JY, Roby DD, Lyons DE, Courtot KN, Collis K, Carter HR, Shuford WD, Capitolo PJ (2014) Recent population size, trends, and limiting factors for the Double-crested Cormorant in the western North America: Double-crested Cormorant population trends. The Journal of Wildlife Management 78:1131-1142.

Anderson CD, Roby DD, Collis K (2004) Conservation implications of the large colony of Double-crested Cormorants on East Sand Island, Columbia River Estuary, Oregon, USA. Waterbirds 27:170-176.

Anker-Nilssen T, Erikstad KE, Lorentsen SH (1996) Aims and effort in seabird monitoring: an assessment based on Norwegian data. Wildlife Biology 2:17-26.

Antolos M, Roby DD, Lyons DE, Anderson SK, Collins K (2006) Effects of nest density, location and timing of breeding success of Caspian Terns. Waterbirds 29:465-472.

B.C. Conservation Data Centre (1994) Species Summary: *Phalacrocorax pelagicus*. B.C. Ministry of Environment. Available: https://a100.gov.bc.ca/pub/eswp/ (accessed 16 December 2020).

B.C. Conservation Data Centre (1995) Species Summary: *Phalacrocorax auritus*. B.C. Ministry of Environment. https://a100.gov.bc.ca/pub/eswp/ (accessed 14 December 2020)

B.C. Conservation Data Centre (2021) BC Species and Ecosystems Explorer. B.C. Ministry of Environment. Victoria, British Columbia. https://a100.gov.bc.ca/pub/eswp/ (accessed 23 February 2021)

Bell A (August 6, 2020) Ontario's cormorant hunt: setting the record straight. Ontario Nature, Toronto, Ontario. https://ontarionature.org/ontarios-cormorants/ (accessed 8 March 2020)

Black C (2018) Spying on seabirds: a review of time-lapse photography capabilities and limitations. Seabird 31:1-14.

Black C, Rey AR, Hart T (2017) Peeking into the bleak midwinter: investigating nonbreeding strategies of Gentoo Penguins using a camera network. Auk 134:520-529

Blaise K (2019) Ontario's proposal to establish a hunting season for the Double-crested Cormorant. The Canadian Environmental Law Association, Toronto, Ontario.

British Columbia – Wildlife Act, R.S.B.C. 1996, c. 488 (1996) https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/96488_01#section4 (accessed 28 January 2021)

Brown CR, Brown MB (2001) Avian coloniality: progress and problems. Current Ornithology 16:1-82.

Brown K (February 6, 2019) A federal bird kill in the Columbia River did nothing to save salmon. Willamette Week, Portland, Oregon. https://www.wweek.com/news/2019/02/06/a-federal-bird-kill-in-the-columbia-river-did-nothing-to-save-salmon/ (accessed 3 March 2021)

Brunton DH (1997) Impact of predators: center nests are less successful than edge nests in a large nesting colony of Least Terns. The Condor 99:372-380.

Buckley FG, Buckley PA (1980) Habitat Selection and Marine Birds. In: Burger J, Olla BL, Winn HE (eds.) Behavior of Marine Animals 69-112. Springer, Boston, Massachusetts.

Butler RW (2015) Pelagic Cormorant in Davidson PJA, Cannings RJ, Couturier AR, Lepage D, Di Corrado CM (eds.). The Atlas of the Breeding Birds of British Columbia, 2008-2012. Bird Studies Canada. Delta, B.C. http://www.birdatlas.bc.ca/accounts/speciesaccount.jsp?sp=DCCO&lang=en (accessed 19 December 2019)

Campbell RW, Dawe NK, McTaggart-Cowan I, Cooper JM, Kaiser GW, McNall MCE (1990) The birds of British Columbia, Volume 1. Introductions, Loons through Waterfowl. Royal British Columbia Museum, Victoria, British Columbia.

Carter HR (2014a) Survey of seabird breeding colonies between Powell River and Vancouver, British Columbia, on 13-16 July 2014. Unpubl. report, Carter Biological Consulting, Victoria, British Columbia.

Carter HR (2014b) Survey of Pelagic and Double-crested Cormorant breeding colonies at Mandarte Island and Vancouver Bridges in 2009 and 2010. Unpubl. report, Carter Biological Consulting, Victoria, British Columbia.

Carter HR (2014c) Survey of seabird breeding colonies between Powell River and Vancouver, British Columbia, on 13 16 July 2014. Report prepared for British Columbia Ministry of Forests, Lands and Natural Resource Operations, Canadian Wildlife Service, and British Columbia Parks. Unpublished report, Carter Biological Consulting, Victoria, British Columbia.

Carter HR, Chatwin TA, Drever MC (2017) Changes in cormorant populations in the Strait of Georgia, British Columbia, 1955-2015. Salish Sea Ecosystem Conference. 101.

Carter HR, Chatwin TA, Drever MC (2018) Breeding population sizes, distributions, and trends of Pelagic, Double-crested, and Brandt's Cormorants in the Strait of Georgia, British Columbia, 1955–2015. Northwestern Naturalist 99(1):31-48.

Carter HR, Drever MC (2016) Double-crested Cormorants and other seabirds breeding at the Second Narrows Bridge and Power Tower in Vancouver, British Columbia, in 2016. Unpubl. report, Carter Biological Consulting, Victoria, British Columbia.

Carter HR, Hobson KA, Sealy SG (1984) Colony-site selection by Pelagic Cormorants (*Phalacrocorax pelagicus*) in Barkley Sound, British Columbia. Colonial Waterbirds 7:25-34.

Chastant JE, King DT, Weseloh DVC, Moore DJ (2014) Population dynamics of Double-crested Cormorants in two interior breeding areas. The Journal of Wildlife Management 78(10):3-11.

Chatwin T, Mather MH, Giesbrecht TD (2003) Changes in Pelagic and Double-Crested Cormorant Nesting Populations in the Strait of Georgia, British Columbia. Northwestern Naturalist 83:109.

Chatwin TA, Mather MH, Giesbrecht TD (2001) Double-crested and Pelagic Cormorant inventory in the Strait of Georgia in 2000. Central West Coast Forest Association, Nanaimo, British Columbia.

Chatwin TA, Mather MH, Giesbrecht TD (2002) Changes in Pelagic and Double-Crested Cormorant nesting populations in the Strait of Georgia, British Columbia. Northwestern Naturalist 83:109-117.

City of Vancouver (2018) Vancouver's changing shoreline: preparing for sea level rise. Vancouver, British Columbia.

City of Vancouver (2020) Street and Traffic By-law No. 2849. Vancouver, British Columbia.

Clark AC, Kollasch TM, Williamson DA (2006) Movements of Double-crested Cormorants fledged on the Columbia River Estuary. Northwestern Naturalist 87(2):150-152.

Cliff T (December 24, 2018) Birders urge city to keep ramp during I Street Bridge rebuild to protect a rare bird. https://www.sacbee.com/news/local/article223285815.html (accessed 8 March 2021)

Collis K, Roby DD, Craig DP, Adamany S, Adkins JY, Lyons DE (2002) Colony size and diet composition of piscivorous waterbirds on the lower Columbia River: implication for losses of juvenile salmonids to avian predation. Transactions of the American Fisheries Society 131:537-550.

Cotnam H (September 18, 2020) Local hunter defends controversial cormorant hunt. CBC News. https://www.cbc.ca/news/canada/ottawa/cormorant-hunter-1.5727779 (accessed 8 March 2020)

Coulson JC (1968) Differences in the quality of birds nesting in the center and on the edges of a colony. Nature 217:478-479.

Cutler TL, Swann DE (1999) Using remote photography in wildlife ecology: a review. Wildlife Society Bulletin 27:571-581.

Diamond AW (2001) Marine biodiversity monitoring – Protocol for Monitoring Seabirds. Fredericton, New Brunswick, Canada.

Dodge WE, Synder DP (1960) An automatic camera device for recording wildlife activity. Journal of Wildlife Management 24:340-342

Dorr BS, Sullivan KL, Curtis PD, Chipman RB, McCullough RD (2016) Wildlife damage management technical series: Double-crested Cormorants. U.S. Department of Agriculture, Animal & Plant Health Inspection Service.

Double-crested Cormorants breeding on Lake Winnipegosis, Manitoba, in 1987. Colonial Waterbirds 12:191-197.

Dunn JL, Alderfer JK (2008) National Geographic field guide to the birds of western North America. National Geographic, US, Washington D.C.

Edney AJ, Wood MJ (2020) Applications of digital imaging and analysis in seabird monitoring and research. Cheltenham, United Kingdom: British Ornithologists' Union. Ibis 163:317-337.

Ehrlich PR, Dobkin DS, Wheye D (1988) The birder's handbook: a field guide to the natural history of North American Birds. Simon & Schuster Inc., Toronto, Ontario.

Elliot RD (1985) The exclusion of avian predators from aggregations of nesting lapwings (*Vanellus vanellus*). Animal Behavior 33:308-314.

Field SA, Tyre AJ, Possingham HP (2005) Optimizing allocation of monitoring effort under economic and observational constraints. Journal of Wildlife Management 69:473-482.

Flynn D, Lynch TP, Devine C (2016) CSIRO Ruggedised Autonomous Gigapixel Systems (CRAGS) photographic time-series assessment of coastal use at two sites in Sydney, Australia. Final report to the NSW government.

Fogarty DT, Elmore RD, Fuhlendorf SD, Loss SR (2017) Influence of olfactory and visual cover on nest site selection and nest success for grassland-nesting birds. Ecology and Evolution 7:6247-6258.

GigaPan (2013) About Gigapan. http://www.gigapan.com/cms/about-us (accessed 10 December 2019)

Götmark F, Anderson M (1984) Colonial breeding reduces nest predation in the Common Gull (*Larus canus*). Animal Behavior 32:485-492.

Government of Canada (2021) Daily data report for July 2020. https://climate.weather.gc.ca/climate_data/daily_data_e.html?StationID=52941&timeframe=2&StartYear=1840&EndYear=2021&Day=25&Year=2020&Month=7# (accessed 20 March 2021)

Green GW, Anderson DC (1961) A simple and inexpensive apparatus for photographing events at pre-set intervals. The Canadian Entomologist 93:741-745.

Halpin LR, Drever MC (2017) Double-crested Cormorants, Pelagic Cormorants and other seabirds nesting in Vancouver and the Strait of Georgia, British Columbia, in 2017. Unpubl. report, Halpin Wildlife Research, Vancouver, British Columbia.

Harris MP (1982) Promiscuity in the Shag as shown by timelapse photography. Bird Study 29:149-154.

Hatch JJ, Weseloh DVC (1999) Double-crested Cormorant (*Phalacrocorax auritus*). In The Birds of North America, No. 441 (Poole A and Gill F (eds.)). The Birds of North America, Inc., Philadelphia, Pennsylvania.

Hemmera (2018a) Ironworkers Memorial Second Narrows Crossing bird management plan – phase 1: avian use study. Prepared for BC Ministry of Transportation and Infrastructure. Hemmera Envirochem Inc, Burnaby, British Columbia.

Hemmera (2018b) Ironworkers Memorial Second Narrows Crossing bird management plan – phase 2: management options. Prepared for BC Ministry of Transportation and Infrastructure. Hemmera Envirochem Inc, Burnaby, British Columbia.

Hemmera (2019) Ironworkers Memorial Second Narrows Crossing bird management plan: 2019 cormorant nesting survey. Prepared for BC Ministry of Transportation and Infrastructure. Hemmera Envirochem Inc, Burnaby, British Columbia.

Hemmera (2021) 2020 Avian related monitoring and assessment services. Unpublished report prepared for the City of Vancouver. Hemmera Environchem Inc, Burnaby, British Columbia.

Hennemann WW III (1982) Spread-winged behaviour of Double-crested and Flightless Cormorants *Phalacrocorax auritus* and *P. harrisi*: wing drying or thermoregulation. Ibis 126:230-239.

Hinke JT, Barbosa A, Emmerson LM, Hart T, Juáres MA, Korczak-Abshire M, Millinevsky G, Santos M, Trathan PN, Watters GM, Southwell C (2017) Estimating nest-level phenology and reproductive success of colonial seabirds using time-lapse cameras. Methods in Ecology and Evolution 9:1853-1863.

Hipfner J, Greenwood J (2009) Timing and Success of Breeding in Pelagic Cormorants at Triangle Island, British Columbia, 2003–2008. Northwestern Naturalist 90:238-243.

Hipfner JM, Blight LK, Lowe RW, Wilhelm SI, Robertson GJ, Barrett R, Anker-Nilssen T, Good TP (2012) Unintended consequences: how the recovery of sea eagle Haliaeetus spp. populations in the northern hemisphere is affecting seabirds. Marine Ornithology 40:39-52.

Hipfner M (2015) Pelagic Cormorant in Davidson, PJA, Cannings RJ, Couturier AR, Lepage D, Di Corrado CM (eds.). The Atlas of the Breeding Birds of British Columbia, 2008-2012. Bird Studies Canada. Delta, B.C. http://www.birdatlas.bc.ca/accounts/speciesaccount.jsp?sp=DCCO&lang=en (accessed 19 December 2019)

Hobson KA (2013) Pelagic Cormorant (*Phalacrocorax pelagicus*), version 2.0. The birds of North America (Poole AF (eds.)). Cornell Lab of Ornithology, Ithaca, New York.

Hobson KA, Wilson D (1985) Colony establishment by Pelagic Cormorants on man made structures in Southwest Coastal British Columbia. The Murrelet 66(3):84-86.

Huang CP, Lavenburg G (2011) Impacts of bird droppings and deicing salts on highway structures: monitoring, diagnosis, prevention. University of Delaware, Newark, Delaware.

Huffeldt NP, Merkel FR (2013) Remote time-lapse photography as a monitoring tool for colonial breeding seabirds: a case study using Thick-billed Murres (*Uria lomvia*). Waterbirds 36:330-341.

Hunt DJ, Evans Rm, Shnier G (1992) Bald Eagle predation on inland Double-crested Cormorant. Blue Jay 50:115-116.

Hutchinson AE (1980) Estimating numbers of colonial nesting seabirds: a comparison of techniques. Proceedings of the Colonial Waterbird Group 3:235-244.

Islands Trust (2008) Gabriola Island community profile. Malaspina University-College, Nanaimo, British Columbia. http://www.islandstrust.bc.ca/media/314027/Gabriola-Final-Profile-Final-Report.pdf (accessed 19 January 2021)

Janiszewski T, Minias P, Lesner B, Kaczmarek K (2017) Age effects on reproductive success, nest-site location, and offspring condition in the Great Cormorant *Phalacrocorax carbo sinensis*. Journal of Ornithology 158:193-202.

Keith JA (1995) Management policies for cormorants in Canada. Colonial Waterbirds 18(1):234-237.

Kemper G, Weidauer A, Coppack T (2016) Monitoring seabirds and marine mammals by georeferenced aerial photography. International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences Volume XLI-B8, 689-694. Prague, Czech Republic.

Kim D (December 20, 2018) Why Sacramento's plans for the I Street Bridge might put this bird at risk. https://www.sacbee.com/news/local/environment/article223399995.html (accessed 8 March 2021)

Kortland A (1995) Patterns of pair-formation and nest-building in the European cormorant *Phalacrocorax carbo sinensis*. Ardea 83:11-25.

Lewis HF (1929) The natural history of the Double-crested Cormorant. Ru-Mi-Lou Books, Ottawa, Ontario.

Lorentzen E, Choquet R, Steen H (2012) Modelling state uncertainty with photo series data for the estimation of breeding success in a cliff-nesting seabird. Journal of Ornithology 152:477-483.

Lynch TP, Alderman R, Hobday AJ (2015) A high-resolution panorama camera system for monitoring colony-wide seabird nesting behavior. Methods in Ecology and Evolution 6:491-499.

Machmer MM (2008) Great Blue Heron and Bald Eagle inventory and stewardship in the Columbia Basin (2007-2008). Fish & Wildlife Compensation Program, Nelson, British Columbia.

Machmer MM (2017) Columbia Basin Great Blue Heron inventory and stewardship: final report 2016-2017. Columbia Basin Trust and Fish & Wildlife Compensation Program, Castlegar, British Columbia.

McGlashen A (October 26, 2020) Western Cormorants Face 'Collapse' Under a Government Plan, Scientists Warn. Audubon Magazine. https://www.audubon.org/news/western-cormorants-face-collapse-under-government-plan-scientists-warn (accessed 10 January 2021)

McNeil R, Léger C (1987) Nest-site quality and reproductive success of early- and late-nesting Double-crested Cormorants. Wilson Ornithological Society. The Wilson Bulletin 99(2):262-267.

Meier TI (1980) Artificial nesting structures for the Double-crested Cormorants. University of Wisconsin, Stevens Point, Wisconsin.

Meier TI (1981) Artificial nesting structures for the Double-crested Cormorant. Technical Bulletin No. 126. Department of Natural Resources, Madison, Wisconsin.

Mendall HL (1936) The home life and economic status of the Double-crested Cormorant. University of Maine Studies Second Series 38:1-159.

Merkel FR, Johansen KL, Kristensen AJ (2016) Use of time-lapse photography and digital image analysis to estimate breeding success of a cliff-nesting seabird. Journal of Field Ornithology 87(1):84-95

Miltimore K, Fink R (2010) Preliminary mitigation plan. Seismic upgrade of Tower 688, BC Hydro Circuits 2L3 and 2L49. Prepared for BC Hydro Transmission Engineering Environment, Burnaby, British Columbia.

Minias P (2014) Evolution of within-colony distribution patterns of birds in response to habitat structure. Behavioral Ecology and Sociobiology 68:851-859.

Minias P, Kaczmarek K (2013) Is it always beneficial to breed in the centre? Trade-offs in nest site selection within the colony of a tree-nesting waterbird. Journal of Ornithology 154:945-953.

Moul IE, Gebauer MB (2002) Status of the Double-crested Cormorant in British Columbia, British Columbia Ministry of Water, Land and Air Protection, Biodiversity Branch, Victoria, British Columbia.

NASA (National Aeronautics and Space Administration) (2017) Gigapan Photography https://www.nasa.gov/offices/oct/40-years-of-nasa-spinoff/gigapan-photography (accessed 19 December 2019)

Pacific Flyway Council (2012) Pacific Flyway Plan: A Framework for the Management of Double-crested Cormorant Depredation on Fish Resources in the Pacific Flyway. Pacific Flyway Council, U.S. Fish and Wildlife Service, Portland, Oregon.

Pacific Flyway Council (2013) A Monitoring Strategy for the Western Population of Double-crested Cormorants within the Pacific Flyway. Pacific Flyway Council, U.S. Fish and Wildlife Service, Portland, Oregon.

Pacific Seabird Group (2021) 2021 Pacific Seabird Group 48th Annual Meeting. https://pacificseabirdgroup.org/wp-content/uploads/2021/02/PacificSeabirdGroup_Program_2021.pdf

Pascalis FD, Collins PM, Green JA (2018) Utility of time-lapse photography in studies of seabird ecology. PLOS ONE 13:e0208995.

Piper WH (1997) Social dominance in birds. Current Ornithology 14:125-187.

Port Metro Vancouver (2014) Harbour Operations Manual, Vancouver Fraser Port Authority. https://www.acgishipping.com/Portals/0/Port%20of%20Vancouver%20Harbour%20Operations%20Manual.pdf (accessed 11 January 2021)

Port of Vancouver (2021) Port Information Guide. https://www.portvancouver.com/wp-content/uploads/2020/06/2020-06-12-PORT-INFORMATION-GUIDE-FINAL.pdf (accessed 19 January 2021)

Public Safety and Solicitor General (2021) State of emergency extended to continue B.C.'s COVID 19 response. BC Gov News, Victoria, British Columbia. https://news.gov.bc.ca/releases/2021PSSG0008-000190 (accessed 19 January 2021)

Public Sector Digest (2016) An analysis of traffic congestion and policy solutions for Canadian municipalities. Victoria, British Columbia.

Quintana F, Yorio P (1998) Kelp Gull *Larus dominicanus* predation on an Imperial Cormorant *Phalacrocorax atriceps* colony in Patagonia. Marine Ornithology 26:84-85.

Rauzon MJ, Elliott ML, Capitolo PJ, Tarjan LM, McChesney GJ, Kelly JP, Carter HR (2019) Changes in abundance and distribution of nesting Double-crested Cormorants *Phalacrocorax auritus* in the San Francisco Bay area, 1975-2017. Marine Ornithology 47:127-138.

Roberts G (1996) Why individual vigilance declines as group size increases. Animal Behavior 51:1077-1086.

Robertson G, Moreno C, Lawton K, Kirkwood R, Valencia J (2008) Comparison of census methods for black-browed albatrosses breeding at the Ildefonso Archipelago, Chile. Polar Biology 31:153-162.

Roby DD (2020) Comments on the Draft Environmental Impact Statement (DEIS) for the Management of Conflicts Associated with Double-crested Cormorants (USFWS 2020a). https://www.regulations.gov/comment/FWS-HQ-MB-2019-0103-2392 (accessed 10 January 2021)

Roby DD, Collis K, Lyons DE (2003) Conservation and management for fish-eating birds and endangered salmon. Albany, California: USDA Forest Service. General Technical Report PSW-GTR-191.

Rodway MS, Campbell RW, Lemon MJF. in prep. Seabird colonies of British Columbia, Part 4: Salish Sea. Wildlife Afield.

Sazima I (2008) Playful birds: cormorants and herons play with objects and practice their skills. Biota Neotropica 8(2):259-264.

Siegel Causey D, Hunt GL Jr (1981) Colonial defense behavior in Double-crested and Pelagic Cormorants. The Auk 98:522-531.

Siegel-Causey D, Hunt GL Jr (1986) Breeding-site selection and colony formation in Double-crested and Pelagic Cormorants. Oxford Journals, Oxford University Press. The Auk 103(1):230-234.

Sinclair NC, Harris MP, Nager RG, Leakey CDB, Robbins AM (2017) Nocturnal colony attendance by Common Guillemots *Uria aalge* at colony in Shetland during the pre-breeding season. Seabird 30:51-62.

Social Policy and Projects, City of Vancouver (2020) Social Indicators and Trends: City of Vancouver Profile 2020. Vancouver, British Columbia.

Stenzel LE, Carter HR, Henderson RP, Emslie SD, Rauzon MJ, Page GW, O'Brien PY (1995) Breeding success of Double-Crested Cormorants in the San Francisco Bay Area, California. Colonial Waterbirds (18):216-224. Special Publication 1: The Double-crested Cormorant: Biology, Conservation and Management (1995).

Sullivan TM (1998) The timing of breeding in double-crested cormorants (*Phalacrocorax auritus albociliatus*): its effects on clutch size, nestling growth, diet and survival. MSc. Thesis. University of British Columbia, Vancouver, British Columbia.

Thaxter CB, Burton NHK (2009) High definition imagery for surveying seabirds and marine mammals: a review of recent trials and development of protocol. British Trust for Ornithology.

USFWS (U.S. Fish and Wildlife Service) (2020) Final Environmental Impact Statement for the Management of Conflicts Associated with Double-crested Cormorants. U.S. Fish and Wildlife Service, Falls Church, Virginia.

Van Damme LM, Colonel C (2007) Bald Eagle predation and other disturbance factors at Double-crested Cormorant and Great Blue Heron nesting colonies in the Creston Valley, British Columbia. Wildlife Afield 4(2):213-232.

Velando A, Freire J (2001) How general is the central periphery distribution among seabird colonies? Nest spatial pattern in the European Shag. The Condor 103:544-554.

Velando A, Freire J (2003) Nest-site characteristics, occupation and breeding success in the European Shag. Waterbirds 26:473-483.

Vermeer K, Morgan KH, Smith GEJ (1989) Population trends and nesting habitat of Double-crested and Pelagic Cormorants in the Strait of Georgia p94-99. In Vermeer K, Butler RW (eds.). The ecology and status of marine birds in the Strait of Georgia, British Columbia. Special Publication, Canadian Wildlife Service, Ottawa, Ontario.

Waldron A, Mooers AO, Miller DC, Nibbelink N, Redding D, Kuhn TS, Roberts JT, Gittleman JL (2013) Targeting global conservation funding to limit immediate biodiversity declines. Proceedings of the National Academy of Sciences of the United States of America 110:12144-12148.

Walsh PM, Halley DJ, Harris MP, Del Nevo A, Sim IMW, Tasker ML (1995) Seabird monitoring handbook for Britain and Ireland. Peterborough: Joint Nature Conservation Committee, RSPB, Institute of Terrestrial Ecology, The Seabird Group.

Waters H (August 25, 2015) Killing cormorants won't help salmon, says government's own study. National Audubon Society, New York City, New York. https://www.audubon.org/news/killing-cormorants-wont-help-salmon-says-governments-own-study (accessed 2 March 2021)

Watts B (2020) Social distancing in birds. The Center for Conservation Biology, Williamsburg, Virginia. https://ccbbirds.org/2020/04/01/social-distancing-in-birds/ (accessed 2 March 2021)

Weller MW, Derksen DV (1972) Use of time-lapse photography to study nesting activities of birds. Auk 89:196-200.

Wilhelm SI, Mailhiot J, Arany J, Chardine JW, Robertson GJ, Ryan PC (2015) Update and trends of three important seabird populations in the western North Atlantic using a geographic information system approach. Marine Ornithology 43:211-222.

Wires LR (2014) The Double-crested Cormorant: Plight of a Feathered Pariah. Yale University Press.

Wires LR, Cuthbert FJ (2006) Historic populations of the Double-crested Cormorant (*Phalacrocorax auritus*): implications for conservation and management in the 21st century. Waterbirds 29(1):9-37.

Wires LR, Cuthbert FJ, Trexel DR, Joshi AR (2001) Status of the Double-crested Cormorant (*Phalacrocorax auritus*) in North America. Final Report to USFWS. University of Minnesota, Department of Fisheries and Wildlife, St. Paul, Minnesota.

Yorio P, Quintana F (1997) Predation by Kelp Gulls *Larus dominicanus* at a mixed species colony of Royal terns Sterna maxima and Cayenne Terns *Sterna eurygnatha* in Patagonia. Ibis 139:536-541.

Appendix A.

Sony, GigaPan, and GoPro.

Table A-1. Sony camera system's options and settings for sampling at Span 2 of the Ironworkers Memorial Bridge in Vancouver, British Columbia, in 2020.

	Setting
Mode	Manual
Focus	DMF single-lock focus with touch operation
Focal length	200 mm
Aperture (F-stop)	5.6-9
Shutter	1/500-1/3200
Exposure	Auto bracketed at 1-2 stops (+1 EV and -1 EV; +2 EV and -2 EV)
ISO	500-3200
White Balance	Automatic
Metering	Spot
Image Quality	X.FINE JPEG
Image Size	9504×6336

Table A-2. Sony camera system's options and settings for sampling at Span 3 of the Ironworkers Memorial Bridge in Vancouver, British Columbia, in 2020.

	Setting
Mode	Manual
Focus	DMF single-lock focus with touch operation
Focal length	397-400 mm
Aperture (F-stop)	6.3-10
Shutter	1/800-1/2500
Exposure	Auto bracketed at 1-2 stops (+1 EV and -1 EV; +2 EV and -2 EV)
ISO	500-1600
White Balance	Automatic
Metering	Spot
Image Quality	X.FINE JPEG
Image Size	9504×6336

Table A-3. GigaPan system's menu options and settings (firmware version 171) for sampling at Spans 2 and 3 of the Ironworkers Memorial Bridge in Vancouver, British Columbia, in 2020.

Option	Setting
Time/Exposure	1.0 s
Multi Picture	1
Brackets	3
EV Step Size	1
Mirror Lock-up	Off
Mirror Lock-up Time	0.50 s
Shutter Teach	Off
Start Del/trig	None
Timelapse/Series	Timer
Expert Options	
Checklist	On
Shutter Mode	Remote
Shutter Length	Bulb
Motor Speed	Med
Motors Rigid	Off
Pretrigger Delay	0.50 s
Bracket Delay	1.5 s
Picture Overlap	30%
Optimize Pan	On

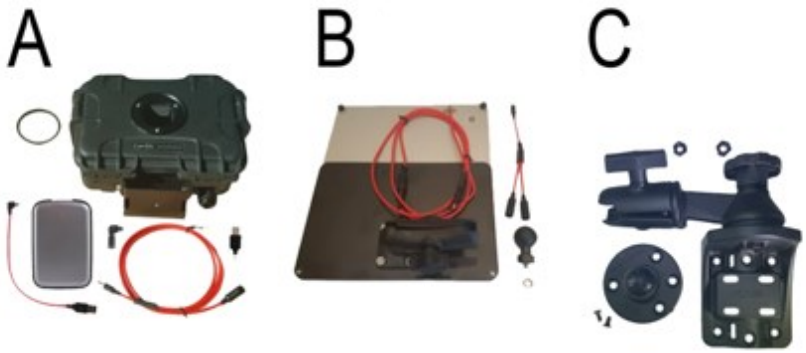


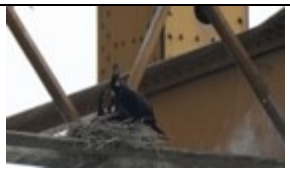
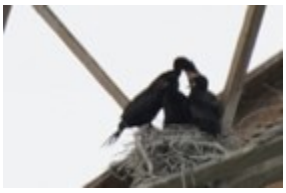
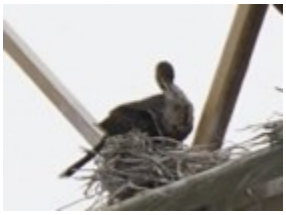
Figure A-1. GoPro's time lapse camera setup on Gabriola Island seacliffs in British Columbia. (A) DryX outdoor enclosure and V50 battery kit that consisted of a weather proof enclosure, V50 battery and its charging cables, lens filter, and power cable. (B) Solar panel kit that was connected to the V50 battery in the DryX enclosure that provided power to the GoPro HERO7 camera. (C) Mounting arm that was clamped to the DryX enclosure and mounted on sandstone cliff surface.

Note: Photograph by CamDo Solutions Inc., 2020

Appendix B.

Cormorant Visual Inspection and Identification.

Table B-1. GigaPan image identification attributes for Double-crested Cormorant chicks, juveniles and adults on the Ironworkers Memorial Bridge in Vancouver, British Columbia.

Identification	Definition	Observation
Chicks	1. Open-mouthed small birds with snaky heads with their parent(s) in standing posture	
	2. Parents are feeding or regurgitating food to small or medium birds	
	3. Black downy small to medium birds that are not matte-black	
	4. Black downy small to medium birds that have shorter and smaller bills	
	5. Black downy birds with immature heads (that is, fuzzy feathers)	
Juveniles	1. Birds with pale bellies and breasts	

	2.	Black downy birds with underdeveloped, emerging, and/or less refined wing feathers	
Parents	1.	Birds with developed, more refined, and matte-black wing feathers when backing the camera	
	2.	Larger birds with larger and deep yellow bills	
	3.	Larger birds with dark breasts and bellies	
	4.	Larger birds whose wing are refined and matte black	
Breeding parents/pairs	1.	Birds with white crests	

Appendix C.

Sony and GigaPan Sampling Designs and Settings.

Span 0.

GigaPan robotic and Sony camera systems were used to sample Span 0, where, the first span of the Ironworkers Memorial Bridge was recorded. Sampling design was similar to that of Span 2 and Span 3.

Span 1.

Span 1 is the longest span that entails 24 sections between two cemented piers, where, below the bridge, the main shipping lane occurs in the second narrows crossing in the Burrard Inlet. Sampling was carried out at low tides during field work. Images were taken with similar GigaPan system and Sony camera settings, but dependent on lighting conditions.

Span 2.

The camera rail was adjusted forward at 20 and tilted at 11-12° vertically upward for the first upper-left image to be recorded. Settings in the camera were manually adjusted to levels that were appropriate in all weather conditions and light variations during daylight hours for the study duration. Settings that were used in the camera were: F6.3-10 aperture stop focused at 397-400 mm, ISO 500-1600, shutter speed 1/800-1/2500s with three bracketing for each image, automatic white balance and spot metering exposure. The camera was manually focused with touch operation to prevent out-of-focus shots. The synchronous camera and GigaPan systems were set to take extra fine (X.FINE) JPEG photographs at 60 MP resolution where image tiles were taken from a top-to-bottom and left-to-right order, and overlapped at 30%.

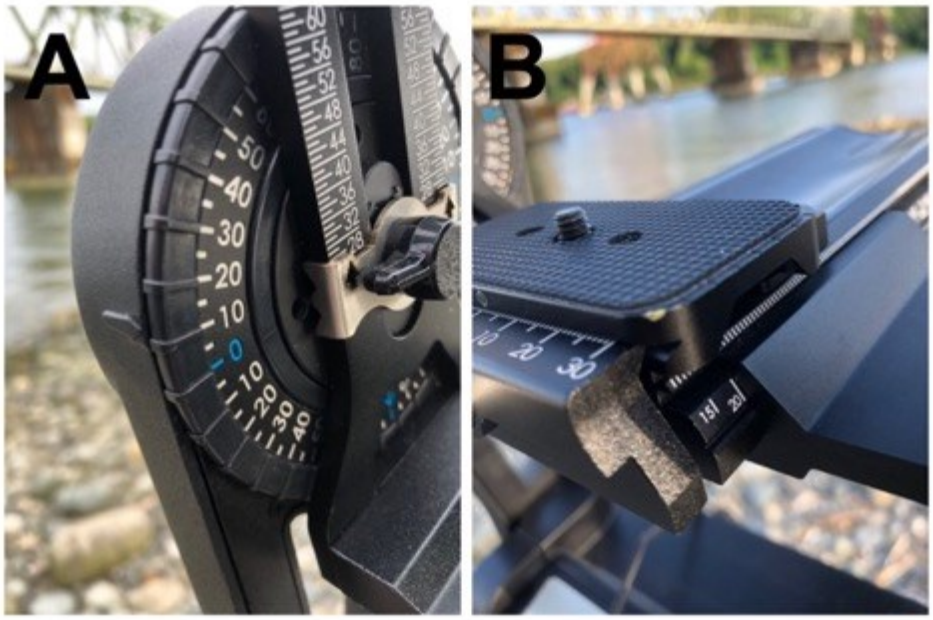


Figure C-1. GigaPan robotic mount settings for Span 2 of the Ironworkers Memorial Bridge in Vancouver, British Columbia. (A) shows the vertical setting and (B) shows the camera railing adjustment.

Span 2 was stratified into 53 bracings (or beams) that were labeled from Section 1 to Section 10 with unique IDs. Then nests were counted and examined on each bracing to characterize the most optimal cormorant nesting location and habitat use on the Ironworkers Memorial Bridge.

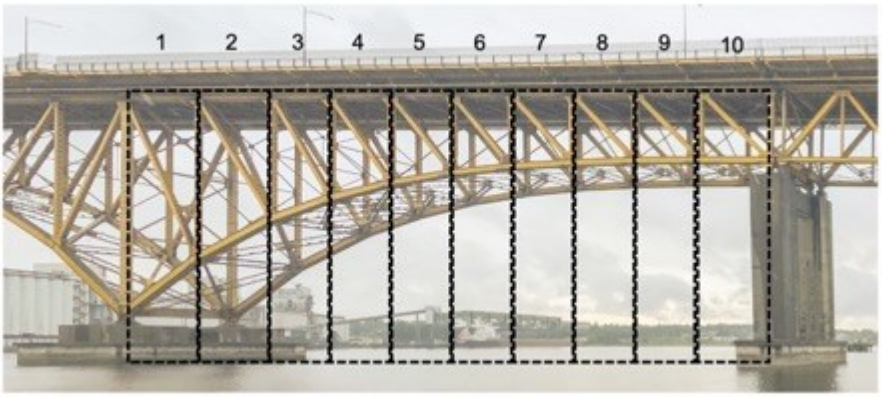


Figure C-2. Span 2 of the Ironworkers Memorial Bridge in Vancouver, British Columbia, was divided into 10 sections, to monitor the Double-crested and Pelagic Cormorants colonies.

Table C-1. 10 sections and 53 bracings of Span 2 of the Ironworkers Memorial Bridge in Vancouver, British Columbia.

	Beam Position	Beam Section	Beam Code
1	Diagonal	1	D1A
2	Diagonal	1	D1B
3	Lower Diagonal	2	LD1A
4	Lower Diagonal	2	LD1B
5	Horizontal	2	H1
6	Diagonal	2	D1A
7	Diagonal	2	D1B
8	Lower Diagonal	3	LD1A
9	Lower Diagonal	3	LD1B
10	Horizontal	3	H1A
11	Horizontal	3	H1B
12	Diagonal	3	D1A
13	Diagonal	3	D1B
14	Diagonal	3	D2A
15	Diagonal	3	D2B
16	Vertical	3	V1A
17	Vertical	3	V1B
18	Vertical	3	V2A
19	Vertical	3	V2B
20	Vertical	3	V2C
21	Vertical	3	V2D
22	Horizontal	4	H1A
23	Horizontal	4	H1B
24	Diagonal	4	D1A
25	Diagonal	4	D1B
26	Diagonal	4	D2A
27	Diagonal	4	D2B
28	Vertical	4	V1A
29	Vertical	4	V1B
30	Horizontal	5	H1
31	Diagonal	5	D1
32	Horizontal	6	H1
33	Diagonal	6	D1
34	Vertical	6	V1
35	Horizontal	7	H1
36	Diagonal	7	D1

37	Vertical	7	V1
38	Horizontal	8	H1
39	Diagonal	8	D1A
40	Diagonal	8	D1B
41	Vertical	8	V1
42	Horizontal	9	H1A
43	Horizontal	9	H1B
44	Diagonal	9	D1A
45	Diagonal	9	D1B
46	Vertical	9	V1A
47	Vertical	9	V1B
48	Horizontal	10	H1A
49	Horizontal	10	H1B
50	Diagonal	10	D1A
51	Diagonal	10	D1B
52	Vertical	10	V1A
53	Vertical	10	V1B

Span 3.

The camera rail for sampling at Span 3 was also adjusted forward at 20 but tilted vertically at approximately 19° for the first upper-left image to be taken. Sampling for the whole duration followed the same protocol as sampling at Span 2 where images were also never taken across the exact time across all study duration. Each GigaPan was composed of 22 columns × 5 rows of shots recording 345 image tiles where they were overlapped at 30% and taken at a vertical column order within 30 minutes.

Camera followed the same settings as sampling at Span 2; however due to the distance of the span of the bridge, the camera was set to: F6.3-10 aperture stop focused at 200 mm focal length, ISO 500-3200, shutter speed 1/500-1/3200s with three bracketing for each image, to adjust to the light variations of the sampling days. White balance and exposure were set to automatic and spot metering, respectively. By using touch operation in the camera, it allowed for in-focus shots.

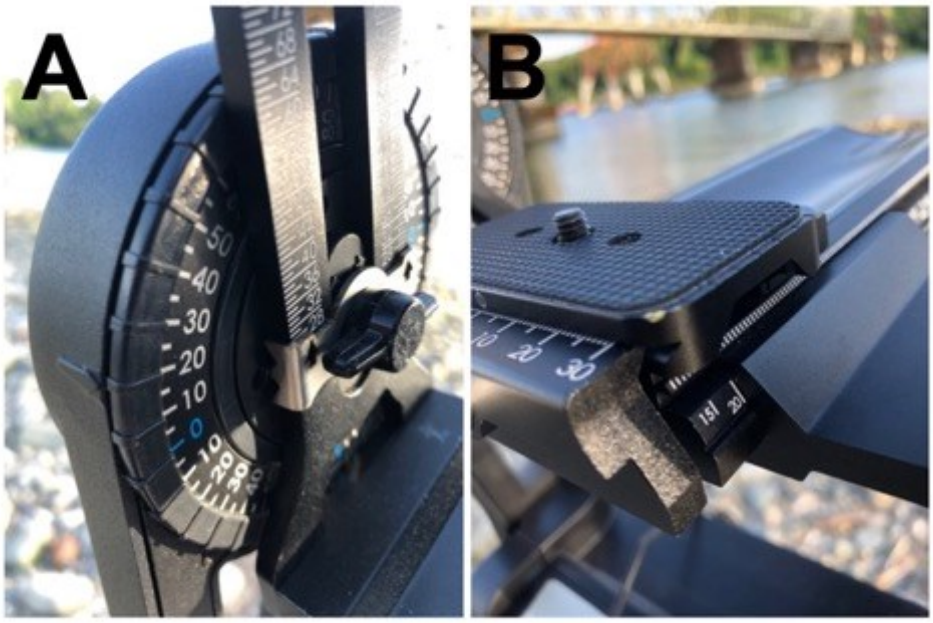


Figure C-3. GigaPan robotic mount settings for Span 3 of the Ironworkers Memorial Bridge in Vancouver, British Columbia. (A) shows the vertical setting and (B) shows the camera railing adjustment.

Span 3 was located between Pier 4 and Pier 6, consisting 16 sections. In contrast to Span 2, this span was only categorized into four sections such that they are similarly attributed due to their structures. Sections 1 and 3 had similar cross frames and floor beams while Sections 2 and 4 were characterized by their girder structure.

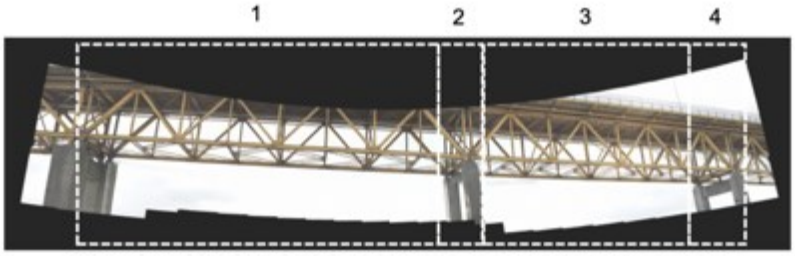


Figure C-4. 16 sections of Span 3 of the Ironworkers Memorial Bridge in Vancouver, British Columbia, was divided into four sections according to the similar bridge attributes for Pelagic Cormorants monitoring.

Span 4.

Image recording for Span 4 was done corresponding to field days that involved sampling the entire Ironworkers Memorial Bridge, from Spans 0-4, following similar settings of Span 2 and Span 3.

Appendix D.

Image Analyses and Visual Inspections.

GigaPan Image Analyses.

Image Preparation.

1. **Image transfer.** The images were transferred to Seagate (Seagate Technology PLC, California, United States) external hard-drive following the image format pre-set in the Sony camera, such as “DSCxxxxx.jpg”, where “xxxxx” corresponds to the order of the photo taken in date and time chronology beginning from “00001”.

2. **Location of image.** Transferred images were placed in folders renamed to a “ddmmyyyy_SNB” format, where, “SNB” represents Second Narrows Bridge; and images for two sampling sections of the Ironworkers Memorial Bridge followed two folder format: (A) “GigaPan_DCCO”, for Span 2 sampling; and (B) “GigaPan_PCO”, for Span 3 sampling, where “PCO” indicated Pelagic Cormorants.

3. **Image inspection.** Images were checked by means of a medium thumbnail view to check for missing image tiles.

4. **Image renaming.** Images that reached the last order of image nomenclature, “DSC09999”, would revert to the first image format, such as “DSC00001.jpg”. These images were renamed to a “DSC_x.jpg”, where, “x” corresponds to the order of the image, starting from “1”.

Image Processing.

5. **Image transfer.** The images were added into GigaPan Stitch v2.3.0306 [Add images], where, initially the images would be placed in a two-row format.

6. **Image alignment.** The images were aligned to 7-8 rows for Span 2, and 4-5 for Span 3.

7. **Image processing.** The image template was saved in the folder created in Step 2, following the file format, (A) “ddmmyyyy_SNB.gigapan”, and (B) “ddmmyyyy_SNB_PC_x.gigapan”, where, “PC” indicated Span 3 that most Pelagic Cormorant breeding activities occurred, and “x” corresponds to the number of sampling, from “1”; and then stitched.

8. **Stitching options.** Images were made sure to be stitched in a columnal order that started from top-down to the right-side direction [Options → Cols, right]. Three boxes had to be checked before stitching, (A) [Options → Vignette correction], (B) [Options → Use larger blending region], and (C) [Options → Mercator projector instead of spherical/equirectangular].

9. **Image stitching.** Images that were stitched in the software required varying durations to produce an individual panoramic image, ranging from 15 minutes to 1.5 days.

10. **Re-start image processing.** When images were not stitched successfully, Step 5 was repeated instead, by using PTGui Pro v11.31. Images that were added [Load Images] would be aligned and set up in a preview where missing reference points in the photograph were manually adjusted. The images were saved in a .pts project file in the folder in Step 2. Complete image was then exported to a RAW and/or TIFF format. All nomenclature of the images followed the existing format in Steps 7 and 11.

Image Export.

11. **Image export.** Panoramic photographs generated were exported [File → Export Stitched Image] into RAW and/or TIFF images that followed the file format, “SNB_ddmmyyyy” or “SNB_PC_x_ddmmyyyy”, for both sampled spans of the Ironworkers Memorial Bridge.

Image Analysis.

12. **Identification and verification.** Zoom in to individual nest and breeding pair visible on every bracing on the bridge, and visually detect if a breeding site (nest) is attended by one or two parents. Sites that appeared to be only silhouettes were

assessed to the best ability by evaluating limiting factors, such as wing and tail feathers, size, neck, and throat, that help alleviate observational biases.

GoPro Image Analyses

Image Preparation.

1. **Image transfer.** Images were added to Seagate external hard-drive with the image format pre-set in the GoPro camera, “Gxxxxxxx.JPG”, where, the first four “xxxx” correspond to numbers that start from “0010” and the consequent “xxx” start from “001”.

Image Export.

2. **Image export.** Images were “AirDropped” to Apple iPad without any prior image alteration and editing.

Image Analysis.

3. **Identification and verification.** Zoom in to individual nest and the breeding pairs that attended the nest. Then, detect visually if parents were attending, in incubation posture, the nest. Sites that only showed silhouettes, due to varying light conditions, were evaluated to the best ability to reduce observational biases.

Post processing was done to extract more details from visual inspections became difficult, although with the brightest screen display. However, only minor post production was done, such as adjustment of exposure, brightness, contrast, black and white, when images corresponded to a left-skewed histograms.

All visual inspections and summaries were then recorded in Microsoft Excel’s spreadsheets. Numbers were recorded with whole numbers and integers, including “0” to denote the case of zero birds, or nests. More additional breeding information were developed to identify birds to prevent biases from observations.

Table D-1. Nomenclature of identification for all visual inspections of all processed images from GigaPan Stitch v2.3.0306.

Identification	Remarks
Integers (0, 1, 2, etc.)	Number of nests, birds, chicks, and/or juveniles
NA, na	1. Nests, birds, chicks, and/or juveniles were obscured 2. Birds, chicks, and/or juveniles were present but due to various light conditions, exact numbers were not determined
Y	Yes
N	No
No_nest	No nest

Cormorant Identification from Visual Inspection.

For all GigaPan composite, and GoPro time-lapse images, birds were identified according to their attributes, including the condition of feathers and back feathers, sizes, and breast colors. Smaller and downy birds corresponded to “chicks” whereas birds that were larger and had semi-matte feathers were “juveniles”. Feeding activities were also inspected from GigaPan images where regurgitation by “parent” was observed. In addition, visual inspections were done by adjusting the screen to the brightest.

Appendix E.

Additional Considerations for the GigaPan Images.

GigaPan Stitch easily handled image processing by rendering small to big sets of image rendering, allowing quick review of individual GigaPan images (Flynn et al. 2016). GigaPan Stitch is easy to manoeuvre and allows quick switching (Flynn et al. 2016) between high-resolution images. Image rendering times vary between these two software programs as they are dependent on the computer's RAM. Nevertheless, GigaPan Stitch rendering times for batches of images from the same location differ significantly at times, with the maximum rendering time up to 1.5 days. I believe huge portion of sky in the image is one factor for the long image rendering that can consequently cause image misalignment (Flynn et al. 2016) (Figure E-1) and stitching failure. Sampling is also challenged by changing topography where each sampling will produce images that vary slightly but capture the essential 10 sections of Span 2 of the Ironworkers Memorial Bridge.

Figure E-1. Lateral bracings that were misaligned in GigaPan Stitch v2.3.0306. This effect does not affect the study's investigation.

PTGui Pro's features are capable of rendering batches of images successfully when control points are needed to be adjusted manually regardless of the same batches

of images used in GigaPan Stitch, but inversely requires a long load time for image output, up to 30 minutes. PTGui Pro rendering and load times are governed by the computer's disk space, and therefore is constrained to a smaller batch of images in stitching processes. Images produced by PTGui Pro are relatively easily manoeuvrable but not zoomed into high-resolution samples as they are created at a fairly low resolution.

In addition to misalignment, ghosting in Figure E-2 is a common phenomenon throughout the GigaPan images. According to Flynn et al. (2016), when stitching software is unable to detect moving objects, the overlapping processes during stitching will create ghosts. This occurs when birds move when the camera tils or pans on the GigaPan robotic mount during sampling. Artificial Intelligence in the stitching programs that is sunable to distinguish or overlap one subject with two different locations will create ghosts. This requires additional time and effort from the observer to accurately distinguish 'bona fide sighting from a false replication' (Flynn et al. 2016) by revisiting the original sampled images. Ghosts effect only affect the aesthetic of the image (Flynn et al. 2016), but in this study, are minute to be noticeable. Misalignment and ghosts do not greatly hamper the observer's ability in interpreting the images, but ghosts will affect 'count-accuracy' (Edney & Wood 2020) in manual image analyses.

Figure E-2. Ghosts that were created by Gigapan Stitch v2.3.0306. This effect requires additional investigation from original images to increase count-accuracy (Edney & Wood 2020).

These systems are capped by changing lighting and wind conditions, obscured views caused by bridge structure obstruction and opaque nest materials, as well as limited vantage point in and around the bridge. These elements add another layer of

difficulty in image processing and analyses. Out of 49 images of Span 2 of the Ironworkers Memorial Bridge, in-depth Double-crested and Pelagic Cormorant nesting activities that were tracked and counted based on 27 images (Appendix H). Not all panoramic images created by GigaPan Stitch and PTGui Pro were counted because preliminary results show that the number of cormorants and their nests decrease after mid-July, thus reducing the image analyses to a weekly basis. In addition, images from PTGui Pro had to be created at a lower resolution because of insufficient disk space on the working laptop. For that reason, the images were not used in cormorant count.

Appendix F.

Components and Classification of the Ironworkers Memorial Bridge in Vancouver, British Columbia.

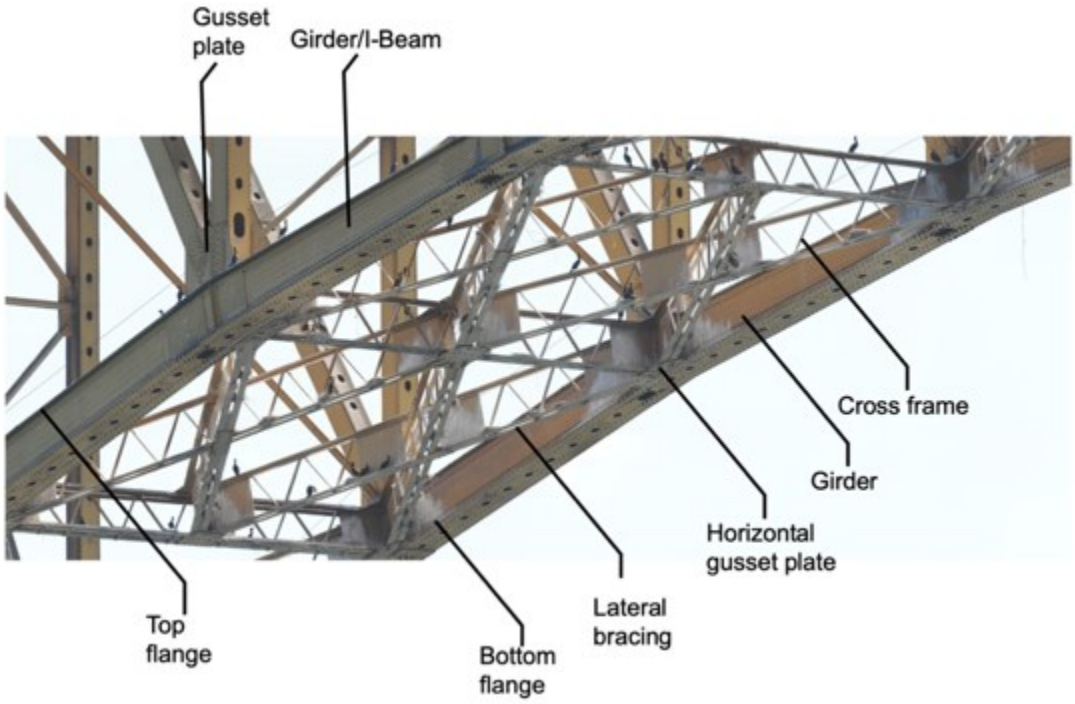


Figure F-1. Components of Ironworkers Memorial Bridge structures and substructures.

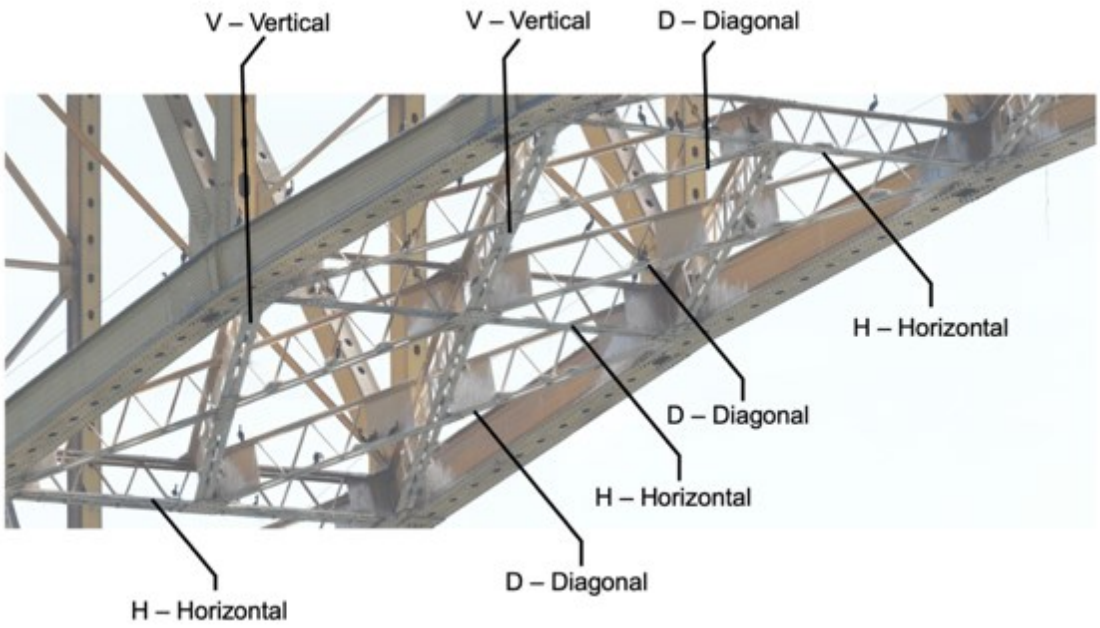


Figure F-2. Classification of lateral beams at the central locations where Double-crested Cormorant nests occurred on the Ironworkers Memorial Bridge.

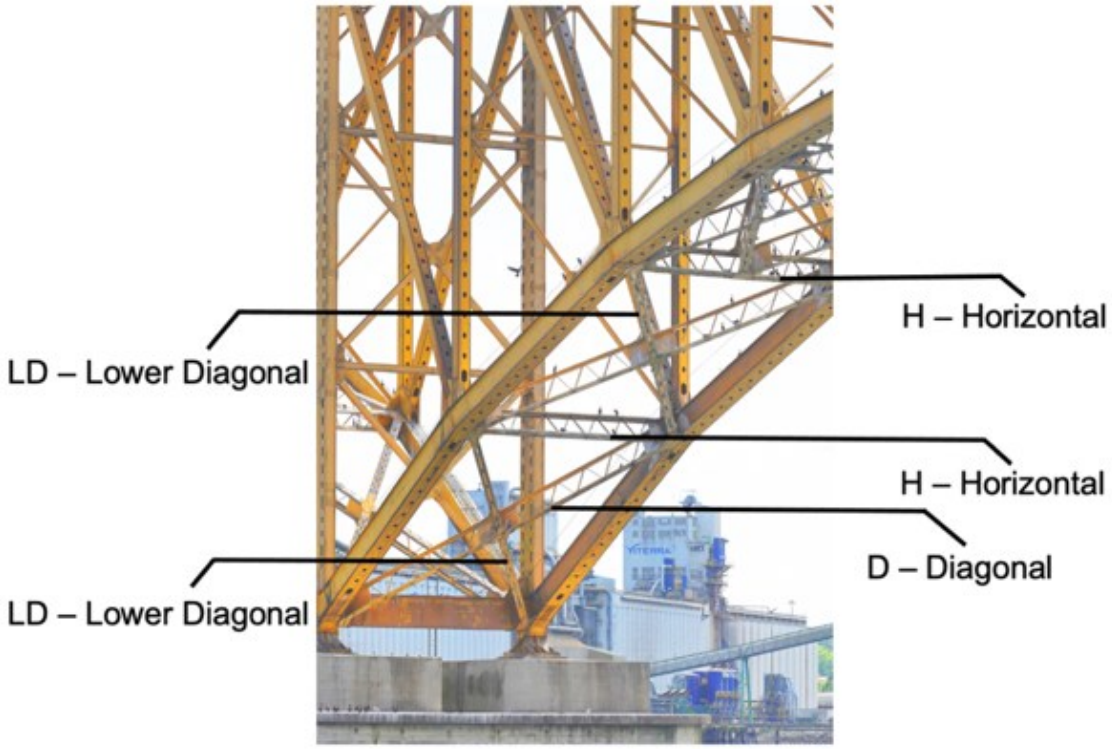


Figure F-3. Classification of the lower lateral beams where Double-crested Cormorant nests occurred on the Ironworkers Memorial Bridge.

Appendix G.

Measurement of the Ironworkers Memorial Bridge component.

Table G-1. Pier heights of Span 3 of the Ironworkers Memorial Bridge in Vancouver, British Columbia, during low tide.

Pier	Measurement 1	Measurement 2	Measurement 3	Measurement 4	Measurement 5	Average (m)
4	34.3	35.8	34.6	34.7	34.1	34.7
5	30.6	31.1	31.4	30.9	31.0	31.0

Table G-2. Sectional widths of Span 3 of the Ironworkers Memorial Bridge in Vancouver, British Columbia, where Pelagic Cormorants nesting occurred.

Section	Measurement 1	Measurement 2	Measurement 3	Average (m)
1	7.0	7.0	8.0	7.3
2	8.0	8.9	7.4	8.1
3	9.0	7.0	8.0	8.0
4	6.9	7.4	8.0	7.4
5	7.0	7.0	8.0	7.3
6	9.0	7.0	8.0	8.0
7	8.0	7.3	7.5	7.6
8	8.4	10.4	7.0	8.6
Total				**62.4**

Table G-3. Width of all 10 sections of Span 2 of the Ironworkers Memorial Bridge in Vancouver, British Columbia, where most Double-crested Cormorant nesting occurred.

Section	Measurement 1	Measurement 2	Measurement 3	Measurement 4	Measurement 5	Average (m)
1	14.0	14.0	15.0	16.0	14.0	14.6
2	13.7	13.0	13.0	13.8	14.5	13.6
3	10.3	10.0	9.9	10.5	9.9	10.1
4	10.4	10.2	10.3	10.9	10.3	10.4
5	9.3	9.3	10.4	10.1	9.8	9.8
6	9.7	9.7	8.5	8.9	9.6	9.3
7	10.0	9.1	9.7	9.6	9.0	9.5
8	9.7	10.1	9.8	10.5	9.0	9.8
9	9.6	10.0	10.0	10.1	9.9	9.9
10	11.0	9.4	11.0	9.9	10.7	10.4
Total						**107.4**

Table G-4. Horizontal bracing heights above highwater mark of Span 2 of the Ironworkers Memorial Bridge in Vancouver, British Columbia.

Beam	Height (m)
1H1	NA
2H1	18.6
3H1	26.6
4H1	29.6
5H1	32.6
6H1	33.6
7H1	34.6
8H1	34.6
9H1	35.6
10H1	34.6

Appendix H.

Metadata of Sampling.

Table H-1. GigaPan images that were sampled from Span 2 and Span 3 of the Ironworkers Memorial Bridge in Vancouver, British Columbia. Solid dot represents image that was processed. Blank, or missing values means no image was processed.

Date	Span 2	Span 3
June 3, 2020	•	•
June 5, 2020	•	•
June 6, 2020		•
June 8, 2020	•	•
June 10, 2020	•	•
June 12, 2020		•
June 15, 2020		•
June 17, 2020	•	•
June 19, 2020	•	•
June 22, 2020	•	•
June 24, 2020	•	•
June 26, 2020	•	•
June 29, 2020	•	•
July 3, 2020	•	•
July 6, 2020		•
July 8, 2020	•	•
July 10, 2020		•
July 13, 2020		•
July 15, 2020	•	•
July 17, 2020		•
July 20, 2020		•
July 22, 2020	•	•
July 24, 2020		•
July 27, 2020		•
July 29, 2020	•	•
July 31, 2020		•
August 3, 2020	•	•
August 5, 2020		•
August 7, 2020		•
August 10, 2020	•	•
August 12, 2020		•
August 14, 2020		•

August 17, 2020	•	•
August 19, 2020		•
August 21, 2020		•
August 24, 2020	•	•
August 26, 2020		•
August 28, 2020	•	•
August 31, 2020		•
September 2, 2020	•	•
September 4, 2020		•
September 9, 2020	•	•
September 11, 2020		•
September 16, 2020		•
September 18, 2020	•	
September 25, 2020	•	
October 2, 2020	•	
December 22, 2020	•	
March 5, 2021	•	
Total	**27**	**44**

Appendix I.

Metadata for Double-crested Cormorant at the Ironworkers Memorial Bridge.

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 3, 2020**	**05:48:40 PM**	**10**	**0**	**9**	**0**	**na**
	Diagonal	2	D1A	June 3, 2020	05:48:40 PM	5	0	6	1	Nest#5-1 (visible juvenile)
	Diagonal	**2**	**D1B**	**June 3, 2020**	**05:48:40 PM**	**6**	**0**	**8**	**1**	**Nest #4 has juveniles**
	Lower Diagonal	3	LD1A	June 3, 2020	05:48:40 PM	9	0	8	4	4 might be juveniles. Nest#1-3, Nest#2 -1
	Lower Diagonal	**3**	**LD1B**	**June 3, 2020**	**05:48:40 PM**	**8**	**NA**	**4**	**NA**	**Nest number includes the top nest**
	Horizontal	**3**	**H1A**	**June 3, 2020**	**05:48:40 PM**	**5**	**NA**	**6**	**NA**	**There might be chicks but not visible**
	Horizontal	3	H1B	June 3, 2020	05:48:40 PM	5	0	4	3	Nest#3-1; Nest#5-2
	Diagonal	3	D1A	June 3, 2020	05:48:40 PM	4	0	3	0	na
	Diagonal	3	D1B	June 3, 2020	05:48:40 PM	4	0	5	0	na
	Diagonal	**3**	**D2A**	**June 3, 2020**	**05:48:40 PM**	**5**	**0**	**5**	**1**	**1 might be juvenile**
	Diagonal	**3**	**D2B**	**June 3, 2020**	**05:48:40 PM**	**5**	**0**	**3**	**NA**	**na**
	Vertical	3	V1A	June 3, 2020	05:48:40 PM	3	NA	2	NA	na
	Vertical	3	V1B	June 3, 2020	05:48:40 PM	3	NA	2	NA	na
	Vertical	**3**	**V2A**	**June 3, 2020**	**05:48:40 PM**	**6**	**NA**	**6**	**NA**	**2 new nests are found above 3V2A**
	Vertical	3	V2B	June 3, 2020	05:48:40 PM	4	NA	2	NA	na
	Vertical	3	V2C	June 3, 2020	05:48:40 PM	4	NA	2	NA	na
	Vertical	**3**	**V2D**	**June 3, 2020**	**05:48:40 PM**	**3**	**NA**	**2**	**NA**	**na**
	Horizontal	4	H1A	June 3, 2020	05:48:40 PM	4	0	3	0	na
	Horizontal	**4**	**H1B**	**June 3, 2020**	**05:48:40 PM**	**6**	**0**	**6**	**3**	**Nest#4 has 3 visible juveniles; there is a nest above**
	Diagonal	4	D1A	June 3, 2020	05:48:40 PM	5	0	4	2	Nest#5 seems to have juveniles (heads identified); N
	Diagonal	**4**	**D1B**	**June 3, 2020**	**05:48:40 PM**	**4**	**0**	**6**	**0**	**na**
	Diagonal	4	D2A	June 3, 2020	05:48:40 PM	3	0	4	0	na
	Diagonal	4	D2B	June 3, 2020	05:48:40 PM	5	0	4	0	na
	Vertical	4	V1A	June 3, 2020	05:48:40 PM	4	NA	1	NA	na
	Vertical	4	V1B	June 3, 2020	05:48:40 PM	6	NA	1	NA	na
	Horizontal	**5**	**H1**	**June 3, 2020**	**05:48:40 PM**	**9**	**0**	**8**	**0**	**Nest#8 Adult is nursing juveniles**
	Diagonal	5	D1	June 3, 2020	05:48:40 PM	4	0	4	0	na
	Horizontal	**6**	**H1**	**June 3, 2020**	**05:48:40 PM**	**10**	**0**	**11**	**0**	**Nests#2, 3, and 6 are under construction**
	Diagonal	**6**	**D1**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 3, 2020**	**05:48:40 PM**	**7**	**NA**	**3**	**NA**	**na**
	Horizontal	**7**	**H1**	**June 3, 2020**	**05:48:40 PM**	**6**	**0**	**6**	**0**	**na**
	Diagonal	7	D1	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Vertical	7	V1	June 3, 2020	05:48:40 PM	2	NA	0	NA	Birds are not visible
	Horizontal	8	H1	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 3, 2020**	**05:48:40 PM**	**2**	**0**	**2**	**0**	**na**
	Horizontal	**9**	**H1B**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Diagonal	9	D1B	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Vertical	9	V1A	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Vertical	9	V1B	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Diagonal	10	D1A	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Diagonal	10	D1B	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 3, 2020**	**05:48:40 PM**	**1**	**0**	**1**	**0**	**na**
	Vertical	10	V1B	June 3, 2020	05:48:40 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						93	0	86	5	
TOTAL SUM						167	0	141	15	
TOTAL CHICKS AND ADULTS									156	

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 5, 2020**	**06:28:26 PM**	**10**	**0**	**11**	**0**	**na**
	Diagonal	2	D1A	June 5, 2020	06:28:26 PM	5	0	6	0	na
	Diagonal	**2**	**D1B**	**June 5, 2020**	**06:28:26 PM**	**6**	**0**	**6**	**3**	**Nest#3-1; Nest#5-1 (covered by adult); Nest#6 (pare**
	Lower Diagonal	3	LD1A	June 5, 2020	06:28:26 PM	6	0	6	2	Nest#2-2
	Lower Diagonal	**3**	**LD1B**	**June 5, 2020**	**06:28:26 PM**	**8**	**NA**	**1**	**2**	**Nest#5-2; Nest#6-1 (the location is a bit blurry)**
	Horizontal	**3**	**H1A**	**June 5, 2020**	**06:28:26 PM**	**5**	**0**	**5**	**2**	**Nest#2-1; Nest#3-1**
	Horizontal	3	H1B	June 5, 2020	06:28:26 PM	5	0	7	2	Nest#3-1, Nest#5-1
	Diagonal	3	D1A	June 5, 2020	06:28:26 PM	4	0	4	NA	na
	Diagonal	3	D1B	June 5, 2020	06:28:26 PM	4	0	6	NA	na
	Diagonal	**3**	**D2A**	**June 5, 2020**	**06:28:26 PM**	**6**	**0**	**5**	**1**	**Nest#4 has a Juvenile**
	Diagonal	**3**	**D2B**	**June 5, 2020**	**06:28:26 PM**	**5**	**0**	**4**	**0**	**There is one nest at the right corner**
	Vertical	3	V1A	June 5, 2020	06:28:26 PM	3	NA	3	NA	na
	Vertical	3	V1B	June 5, 2020	06:28:26 PM	3	0	3	NA	na
	Vertical	**3**	**V2A**	**June 5, 2020**	**06:28:26 PM**	**6**	**NA**	**3**	**NA**	**na**
	Vertical	3	V2B	June 5, 2020	06:28:26 PM	4	NA	3	NA	na
	Vertical	3	V2C	June 5, 2020	06:28:26 PM	4	NA	2	NA	na
	Vertical	**3**	**V2D**	**June 5, 2020**	**06:28:26 PM**	**4**	**NA**	**2**	**NA**	**na**
	Horizontal	4	H1A	June 5, 2020	06:28:26 PM	4	NA	3	NA	na
	Horizontal	**4**	**H1B**	**June 5, 2020**	**06:28:26 PM**	**6**	**NA**	**4**	**3**	**Nest#4-2, one sitting in the nest, and one standing;**
	Diagonal	4	D1A	June 5, 2020	06:28:26 PM	5	NA	5	NA	na
	Diagonal	**4**	**D1B**	**June 5, 2020**	**06:28:26 PM**	**4**	**0**	**2**	**1**	**Nest#4 has a visible chick**
	Diagonal	4	D2A	June 5, 2020	06:28:26 PM	3	0	3	2	Nest#3-2
	Diagonal	4	D2B	June 5, 2020	06:28:26 PM	5	0	3	NA	na
	Vertical	4	V1A	June 5, 2020	06:28:26 PM	5	NA	2	NA	na
	Vertical	4	V1B	June 5, 2020	06:28:26 PM	6	NA	1	NA	na
	Horizontal	**5**	**H1**	**June 5, 2020**	**06:28:26 PM**	**10**	**NA**	**9**	**2**	**New nest beside Nest#3; there is also a nest at the**
	Diagonal	5	D1	June 5, 2020	06:28:26 PM	4	0	4	1	Nest#1-1
	Horizontal	**6**	**H1**	**June 5, 2020**	**06:28:26 PM**	**10**	**0**	**13**	**1**	**na**
	Diagonal	**6**	**D1**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 5, 2020**	**06:28:26 PM**	**7**	**NA**	**1**	**NA**	**na**
	Horizontal	**7**	**H1**	**June 5, 2020**	**06:28:26 PM**	**5**	**0**	**5**	**NA**	**na**
	Diagonal	7	D1	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Vertical	7	V1	June 5, 2020	06:28:26 PM	2	NA	2	NA	na
	Horizontal	8	H1	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 5, 2020**	**06:28:26 PM**	**2**	**0**	**2**	**NA**	**na**
	Horizontal	**9**	**H1B**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Diagonal	9	D1B	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Vertical	9	V1A	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Vertical	9	V1B	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Diagonal	10	D1A	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Diagonal	10	D1B	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 5, 2020**	**06:28:26 PM**	**1**	**0**	**1**	**0**	**na**
	Vertical	10	V1B	June 5, 2020	06:28:26 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						95	0	74	15	
TOTAL SUM						167	0	137	22	
TOTAL CHICKS AND ADULTS									159	
	NA - Possible nests could not be counted due to obscured view or obstruction									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**NA**	**na**
	Diagonal	1	D1B	June 8, 2020	06:10:43 PM	0	0	0	NA	na
	Lower Diagonal	2	LD1A	June 8, 2020	06:10:43 PM	0	0	0	NA	na
	Lower Diagonal	**2**	**LD1B**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**NA**	**na**
	Horizontal	**2**	**H1**	**June 8, 2020**	**06:10:43 PM**	**10**	**0**	**8**	**6**	**Nest #8 has 3 chicks; Nest#2-2, Nest#6-1**
	Diagonal	2	D1A	June 8, 2020	06:10:43 PM	5	0	5	NA	na
	Diagonal	**2**	**D1B**	**June 8, 2020**	**06:10:43 PM**	**6**	**0**	**8**	**1**	**Nest#1-1**
	Lower Diagonal	3	LD1A	June 8, 2020	06:10:43 PM	9	0	5	NA	na
	Lower Diagonal	**3**	**LD1B**	**June 8, 2020**	**06:10:43 PM**	**9**	**3**	**3**	**NA**	**New nest appear on the top of 3LD1B**
	Horizontal	**3**	**H1A**	**June 8, 2020**	**06:10:43 PM**	**5**	**0**	**5**	**9**	**Nest #2-3; Nest #3-3; Nest #4-2; Nest #5-1**
	Horizontal	3	H1B	June 8, 2020	06:10:43 PM	5	0	4	6	Nest#3-2; Nest#4-1; Nest#5-3
	Diagonal	3	D1A	June 8, 2020	06:10:43 PM	4	0	5	3	Nest#1-2; Nest#2-1
	Diagonal	3	D1B	June 8, 2020	06:10:43 PM	5	0	6	NA	na
	Diagonal	**3**	**D2A**	**June 8, 2020**	**06:10:43 PM**	**6**	**0**	**8**	**4**	**Nest#2-3; Nest#3-1**
	Diagonal	**3**	**D2B**	**June 8, 2020**	**06:10:43 PM**	**5**	**0**	**5**	**5**	**There is a pair of birds at the beam but no nest yet;**
	Vertical	3	V1A	June 8, 2020	06:10:43 PM	4	NA	2	1	Nest#3-1
	Vertical	3	V1B	June 8, 2020	06:10:43 PM	3	NA	2	NA	na
	Vertical	**3**	**V2A**	**June 8, 2020**	**06:10:43 PM**	**6**	**NA**	**3**	**1**	**Nest#6 above 3V2A has 1 chick**
	Vertical	3	V2B	June 8, 2020	06:10:43 PM	4	NA	3	NA	na
	Vertical	3	V2C	June 8, 2020	06:10:43 PM	4	NA	4	NA	na
	Vertical	**3**	**V2D**	**June 8, 2020**	**06:10:43 PM**	**4**	**NA**	**3**	**NA**	**na**
	Horizontal	4	H1A	June 8, 2020	06:10:43 PM	4	0	5	5	Nest#3-4; Nest#4-1
	Horizontal	**4**	**H1B**	**June 8, 2020**	**06:10:43 PM**	**6**	**0**	**8**	**6**	**Nest#3-1; Nest#4-3; Nest#5-1; Nest#top-1**
	Diagonal	4	D1A	June 8, 2020	06:10:43 PM	5	0	7	NA	na
	Diagonal	**4**	**D1B**	**June 8, 2020**	**06:10:43 PM**	**4**	**0**	**4**	**2**	**Nest#2-1; Nest#4-1 (identified from the head)**
	Diagonal	4	D2A	June 8, 2020	06:10:43 PM	3	0	5	NA	na
	Diagonal	4	D2B	June 8, 2020	06:10:43 PM	3	0	4	1	Nest#3-1
	Vertical	4	V1A	June 8, 2020	06:10:43 PM	4	NA	3	NA	na
	Vertical	4	V1B	June 8, 2020	06:10:43 PM	6	NA	2	NA	na
	Horizontal	**5**	**H1**	**June 8, 2020**	**06:10:43 PM**	**11**	**0**	**12**	**8**	**New Nest#4 is still building; Nest#7-1; Nest#8-1; Ne**
	Diagonal	5	D1	June 8, 2020	06:10:43 PM	4	0	4	NA	na
	Horizontal	**6**	**H1**	**June 8, 2020**	**06:10:43 PM**	**11**	**0**	**14**	**NA**	**Nests#2, 4, 6 are higher; New Nest next to Nest#3**
	Diagonal	**6**	**D1**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 8, 2020**	**06:10:43 PM**	**8**	**NA**	**2**	**NA**	**New nest appears beside Nest#5**
	Horizontal	**7**	**H1**	**June 8, 2020**	**06:10:43 PM**	**5**	**0**	**4**	**1**	**Nest#3-1**
	Diagonal	7	D1	June 8, 2020	06:10:43 PM	0	0	0	NA	na
	Vertical	7	V1	June 8, 2020	06:10:43 PM	2	0	3	NA	na
	Horizontal	8	H1	June 8, 2020	06:10:43 PM	0	NA	0	NA	na
	Diagonal	**8**	**D1A**	**June 8, 2020**	**06:10:43 PM**	**0**	**NA**	**0**	**NA**	**na**
	Diagonal	8	D1B	June 8, 2020	06:10:43 PM	0	0	0	NA	na
	Vertical	**8**	**V1**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**NA**	**na**
	Horizontal	**9**	**H1A**	**June 8, 2020**	**06:10:43 PM**	**2**	**0**	**2**	**NA**	**Nest#2 is still building**
	Horizontal	**9**	**H1B**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Diagonal	9	D1B	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Vertical	9	V1A	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Vertical	9	V1B	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Diagonal	10	D1A	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Diagonal	10	D1B	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 8, 2020**	**06:10:43 PM**	**1**	**NA**	**NA**	**NA**	**na**
	Vertical	10	V1B	June 8, 2020	06:10:43 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						99	3	89	43	
TOTAL SUM						173	3	158	59	
TOTAL CHICKS AND ADULTS									217	
	NA - Possible nests could not be counted due to obscured view or obstruction									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 10, 2020**	**06:32:25 PM**	**10**	**NA**	**9**	**8**	**Nest#2-3; Nest#3-1; Nest#7-1**
	Diagonal	2	D1A	June 10, 2020	06:32:25 PM	5	0	6	0	na
	Diagonal	**2**	**D1B**	**June 10, 2020**	**06:32:25 PM**	**6**	**0**	**7**	**2**	**Nest#2-2 - very noticeable**
	Lower Diagonal	3	LD1A	June 10, 2020	06:32:25 PM	6	NA	9	NA	na
	Lower Diagonal	**3**	**LD1B**	**June 10, 2020**	**06:32:25 PM**	**7**	**NA**	**6**	**NA**	**na**
	Horizontal	**3**	**H1A**	**June 10, 2020**	**06:32:25 PM**	**5**	**0**	**9**	**3**	**na**
	Horizontal	3	H1B	June 10, 2020	06:32:25 PM	5	0	4	6	na
	Diagonal	3	D1A	June 10, 2020	06:32:25 PM	4	0	4	2	Both Nest#2 and Nest#3 have chicks in the nest
	Diagonal	3	D1B	June 10, 2020	06:32:25 PM	4	0	5	NA	na
	Diagonal	**3**	**D2A**	**June 10, 2020**	**06:32:25 PM**	**6**	**0**	**9**	**2**	**New nest appears beside Nest#4**
	Diagonal	**3**	**D2B**	**June 10, 2020**	**06:32:25 PM**	**5**	**0**	**6**	**4**	**na**
	Vertical	3	V1A	June 10, 2020	06:32:25 PM	4	NA	2	NA	na
	Vertical	3	V1B	June 10, 2020	06:32:25 PM	3	NA	2	NA	na
	Vertical	**3**	**V2A**	**June 10, 2020**	**06:32:25 PM**	**6**	**NA**	**2**	**1**	**There are 2 nests above 3V2A**
	Vertical	3	V2B	June 10, 2020	06:32:25 PM	5	NA	4	NA	New nest appears above 3V2B
	Vertical	3	V2C	June 10, 2020	06:32:25 PM	4	NA	3	NA	na
	Vertical	**3**	**V2D**	**June 10, 2020**	**06:32:25 PM**	**4**	**NA**	**3**	**NA**	**na**
	Horizontal	4	H1A	June 10, 2020	06:32:25 PM	4	NA	4	2	Nest#3-2
	Horizontal	**4**	**H1B**	**June 10, 2020**	**06:32:25 PM**	**6**	**0**	**8**	**3**	**1 juvenile sitting in the nest at the top right corner**
	Diagonal	4	D1A	June 10, 2020	06:32:25 PM	5	0	5	3	Nest#1-3
	Diagonal	**4**	**D1B**	**June 10, 2020**	**06:32:25 PM**	**4**	**0**	**4**	**5**	**Nest#2-1; Nest#3-2; Nest#4-2**
	Diagonal	4	D2A	June 10, 2020	06:32:25 PM	3	0	4	NA	There are some nest materials
	Diagonal	4	D2B	June 10, 2020	06:32:25 PM	5	0	5	2	Nest#2-1; Nest#4-1
	Vertical	4	V1A	June 10, 2020	06:32:25 PM	5	NA	3	NA	na
	Vertical	4	V1B	June 10, 2020	06:32:25 PM	6	NA	5	NA	na
	Horizontal	**5**	**H1**	**June 10, 2020**	**06:32:25 PM**	**11**	**0**	**16**	**6**	**Nest#7-2; Nest#8-2; Nest#9-2**
	Diagonal	5	D1	June 10, 2020	06:32:25 PM	4	0	4	NA	na
	Horizontal	**6**	**H1**	**June 10, 2020**	**06:32:25 PM**	**12**	**NA**	**14**	**NA**	**Nest#2 and Nest#4 are stilling building; Nest#7 is hi**
	Diagonal	**6**	**D1**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 10, 2020**	**06:32:25 PM**	**8**	**NA**	**3**	**NA**	**na**
	Horizontal	**7**	**H1**	**June 10, 2020**	**06:32:25 PM**	**5**	**0**	**5**	**1**	**One juvenile is trying to build its own nest**
	Diagonal	7	D1	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Vertical	7	V1	June 10, 2020	06:32:25 PM	2	0	2	0	na
	Horizontal	8	H1	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 10, 2020**	**06:32:25 PM**	**2**	**0**	**2**	**0**	**na**
	Horizontal	**9**	**H1B**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 10, 2020	06:32:25 PM	0	0	0	0	A bird appears despite no signs of nests
	Diagonal	9	D1B	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Vertical	9	V1A	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Vertical	9	V1B	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Diagonal	10	D1A	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Diagonal	10	D1B	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**The nest last seen on June 8 is gone**
	Vertical	10	V1B	June 10, 2020	06:32:25 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						97	0	103	35	
TOTAL SUM						171	0	174	50	
TOTAL CHICKS AND ADULTS									224	
	NA - Possible nests could not be counted due to obscured view or obstruction									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 17, 2020**	**06:05:07 PM**	**10**	**0**	**14**	**9**	**Nest#4-2; Nest#8-3; Nest#9-1; Nest#10-3**
	Diagonal	2	D1A	June 17, 2020	06:05:07 PM	5	0	5	4	Nest#3 and Nest#5 both have 2 chicks
	Diagonal	**2**	**D1B**	**June 17, 2020**	**06:05:07 PM**	**6**	**0**	**8**	**7**	**Nest#1-1; Nest#2-4; Nest#4-2**
	Lower Diagonal	3	LD1A	June 17, 2020	06:05:07 PM	6	NA	4	1	The nests are getting smaller, and there is a noticea
	Lower Diagonal	**3**	**LD1B**	**June 17, 2020**	**06:05:07 PM**	**9**	**NA**	**1**	**NA**	**There is a nest above 3LB1B**
	Horizontal	**3**	**H1A**	**June 17, 2020**	**06:05:07 PM**	**5**	**0**	**7**	**8**	**Nest#2-3; Nest#3-2; Nest#5-3**
	Horizontal	3	H1B	June 17, 2020	06:05:07 PM	5	NA	5	0	Nest#3-2
	Diagonal	3	D1A	June 17, 2020	06:05:07 PM	4	0	5	5	Nest#1-3; Nest#2-2; Nest#4 is getting smaller
	Diagonal	3	D1B	June 17, 2020	06:05:07 PM	4	0	4	3	Nest#3-3
	Diagonal	**3**	**D2A**	**June 17, 2020**	**06:05:07 PM**	**6**	**0**	**6**	**6**	**Nest#2-3; Nest#3-3**
	Diagonal	**3**	**D2B**	**June 17, 2020**	**06:05:07 PM**	**4**	**0**	**6**	**4**	**Nest#2-2; Nest#3-2; Nest#5 at the corner might be g**
	Vertical	3	V1A	June 17, 2020	06:05:07 PM	4	NA	2	NA	na
	Vertical	3	V1B	June 17, 2020	06:05:07 PM	3	NA	3	NA	na
	Vertical	**3**	**V2A**	**June 17, 2020**	**06:05:07 PM**	**6**	**NA**	**6**	**NA**	**na**
	Vertical	3	V2B	June 17, 2020	06:05:07 PM	4	NA	4	NA	na
	Vertical	3	V2C	June 17, 2020	06:05:07 PM	4	NA	3	NA	na
	Vertical	**3**	**V2D**	**June 17, 2020**	**06:05:07 PM**	**4**	**NA**	**4**	**NA**	**na**
	Horizontal	4	H1A	June 17, 2020	06:05:07 PM	4	NA	4	3	na
	Horizontal	**4**	**H1B**	**June 17, 2020**	**06:05:07 PM**	**6**	**0**	**11**	**4**	**na**
	Diagonal	4	D1A	June 17, 2020	06:05:07 PM	5	0	7	9	Nest#5 is getting smaller; Nest#1-4; Nest#3-2; Nest
	Diagonal	**4**	**D1B**	**June 17, 2020**	**06:05:07 PM**	**4**	**0**	**5**	**6**	**Nest#2-1; Nest#3-3; Nest#4-2**
	Diagonal	4	D2A	June 17, 2020	06:05:07 PM	4	0	5	5	New nest beside Nest#2; Nest#1-2; Nest#2-1; Nest#
	Diagonal	4	D2B	June 17, 2020	06:05:07 PM	5	0	5	3	Nest#2-1; Nest#3-1; Nest#4-1
	Vertical	4	V1A	June 17, 2020	06:05:07 PM	5	NA	3	NA	na
	Vertical	4	V1B	June 17, 2020	06:05:07 PM	6	NA	5	NA	na
	Horizontal	**5**	**H1**	**June 17, 2020**	**06:05:07 PM**	**11**	**0**	**11**	**13**	**Nest#6-3; Nest#7-3; Nest#8-4; Nest#9-3**
	Diagonal	5	D1	June 17, 2020	06:05:07 PM	4	0	4	NA	na
	Horizontal	**6**	**H1**	**June 17, 2020**	**06:05:07 PM**	**11**	**0**	**14**	**NA**	**na**
	Diagonal	**6**	**D1**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 17, 2020**	**06:05:07 PM**	**9**	**NA**	**3**	**0**	**New nest appeara beside Nest#7**
	Horizontal	**7**	**H1**	**June 17, 2020**	**06:05:07 PM**	**5**	**0**	**5**	**NA**	**na**
	Diagonal	7	D1	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Vertical	7	V1	June 17, 2020	06:05:07 PM	2	0	2	NA	na
	Horizontal	8	H1	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 17, 2020**	**06:05:07 PM**	**2**	**2**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Diagonal	9	D1B	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Vertical	9	V1A	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Vertical	9	V1B	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Diagonal	10	D1A	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Diagonal	10	D1B	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	June 17, 2020	06:05:07 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						98	2	101	57	
TOTAL SUM						172	2	171	90	
TOTAL CHICKS AND ADULTS									261	
	NA - Possible nests could not be counted due to obscured view or obstruction									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 19, 2020**	**06:24:13 PM**	**10**	**0**	**10**	**9**	**Nest#2-1; Nest#6-1; Nest#7-2; Nest#8-2; Nest#9-1;**
	Diagonal	2	D1A	June 19, 2020	06:24:13 PM	5	0	7	0	na
	Diagonal	**2**	**D1B**	**June 19, 2020**	**06:24:13 PM**	**6**	**0**	**5**	**9**	**Nest#1-1; Nest#2-3; Nest#4-3; Nest#6-2**
	Lower Diagonal	3	LD1A	June 19, 2020	06:24:13 PM	6	NA	5	NA	na
	Lower Diagonal	**3**	**LD1B**	**June 19, 2020**	**06:24:13 PM**	**8**	**NA**	**3**	**NA**	**na**
	Horizontal	**3**	**H1A**	**June 19, 2020**	**06:24:13 PM**	**5**	**0**	**6**	**5**	**Nest#2-2; Nest#3-1; Nest#5-2**
	Horizontal	3	H1B	June 19, 2020	06:24:13 PM	6	0	9	4	New nest appears at the right corner; Nest#3-2; Nes
	Diagonal	3	D1A	June 19, 2020	06:24:13 PM	4	0	6	1	Nest#4-1
	Diagonal	3	D1B	June 19, 2020	06:24:13 PM	4	0	5	4	Nest#2-2; Nest#4-2
	Diagonal	**3**	**D2A**	**June 19, 2020**	**06:24:13 PM**	**6**	**0**	**7**	**5**	**Nest#2-1; Nest#3-2; Nest#4-1 (very visible chick); N**
	Diagonal	**3**	**D2B**	**June 19, 2020**	**06:24:13 PM**	**4**	**0**	**6**	**7**	**Nest#3 adult is feeding their juvenile; Nest#2-2; Nes**
	Vertical	3	V1A	June 19, 2020	06:24:13 PM	4	NA	2	NA	na
	Vertical	3	V1B	June 19, 2020	06:24:13 PM	3	NA	2	NA	na
	Vertical	**3**	**V2A**	**June 19, 2020**	**06:24:13 PM**	**6**	**NA**	**5**	**1**	**Nest above 3V2A has 1 juvenile**
	Vertical	3	V2B	June 19, 2020	06:24:13 PM	4	NA	3	NA	na
	Vertical	3	V2C	June 19, 2020	06:24:13 PM	4	NA	5	NA	na
	Vertical	**3**	**V2D**	**June 19, 2020**	**06:24:13 PM**	**4**	**NA**	**3**	**NA**	**na**
	Horizontal	4	H1A	June 19, 2020	06:24:13 PM	4	NA	3	5	Nest#3-3; Nest#4-2
	Horizontal	**4**	**H1B**	**June 19, 2020**	**06:24:13 PM**	**6**	**0**	**9**	**5**	**Nest#3-2; Nest#4-2; Nest above 4H1B has 1 juvenile**
	Diagonal	4	D1A	June 19, 2020	06:24:13 PM	5	0	6	5	There are more chicks on Nest#4 identified by their f
	Diagonal	**4**	**D1B**	**June 19, 2020**	**06:24:13 PM**	**4**	**0**	**4**	**NA**	**na**
	Diagonal	4	D2A	June 19, 2020	06:24:13 PM	4	0	6	5	Nest#1-2; Nest#2-2; Nest#5-1
	Diagonal	4	D2B	June 19, 2020	06:24:13 PM	5	0	7	1	Nest#2-1
	Vertical	4	V1A	June 19, 2020	06:24:13 PM	5	NA	2	NA	na
	Vertical	4	V1B	June 19, 2020	06:24:13 PM	6	NA	6	NA	na
	Horizontal	**5**	**H1**	**June 19, 2020**	**06:24:13 PM**	**11**	**NA**	**11**	**5**	**Nest#7-2, Nest#8-3**
	Diagonal	5	D1	June 19, 2020	06:24:13 PM	4	0	4	0	na
	Horizontal	**6**	**H1**	**June 19, 2020**	**06:24:13 PM**	**9**	**0**	**9**	**1**	**Nest#3 was there since June 3 or earlier, now the ne**
	Diagonal	**6**	**D1**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 19, 2020**	**06:24:13 PM**	**9**	**NA**	**3**	**NA**	**na**
	Horizontal	**7**	**H1**	**June 19, 2020**	**06:24:13 PM**	**5**	**0**	**5**	**NA**	**na**
	Diagonal	7	D1	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Vertical	7	V1	June 19, 2020	06:24:13 PM	2	0	2	NA	na
	Horizontal	8	H1	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 19, 2020**	**06:24:13 PM**	**1**	**0**	**1**	**NA**	**Nest#1 is believed to have been taken apart (loose**
	Horizontal	**9**	**H1B**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Diagonal	9	D1B	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Vertical	9	V1A	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Vertical	9	V1B	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Diagonal	10	D1A	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Diagonal	10	D1B	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	June 19, 2020	06:24:13 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						94	0	87	47	
TOTAL SUM						169	0	167	72	
TOTAL CHICKS AND ADULTS									239	
	NA - Possible nests could not be counted due to obscured view or obstruction									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 22, 2020**	**06:01:31 PM**	**10**	**NA**	**13**	**10**	**Nest#2-1; Nest#3-1; Nest#4-2; Nest#8-2; Nest#9-2;**
	Diagonal	2	D1A	June 22, 2020	06:01:31 PM	5	0	5	6	Nest#1-3; Nest#2-2; Nest#3-1
	Diagonal	**2**	**D1B**	**June 22, 2020**	**06:01:31 PM**	**6**	**0**	**8**	**10**	**Nest#2-4; Nest#3-1; Nest#4-1; Nest#6-3**
	Lower Diagonal	3	LD1A	June 22, 2020	06:01:31 PM	6	NA	7	NA	na
	Lower Diagonal	**3**	**LD1B**	**June 22, 2020**	**06:01:31 PM**	**9**	**NA**	**1**	**NA**	**na**
	Horizontal	**3**	**H1A**	**June 22, 2020**	**06:01:31 PM**	**5**	**0**	**6**	**7**	**Nest#2-2; Nest#3-2; Nest#5-3**
	Horizontal	3	H1B	June 22, 2020	06:01:31 PM	6	0	7	5	Nest#3-2; Nest#5-2; Nest#6-1
	Diagonal	3	D1A	June 22, 2020	06:01:31 PM	4	NA	6	6	Nest#1-2; Nest#2-2; Nest#3-2; the last nest is gettin
	Diagonal	3	D1B	June 22, 2020	06:01:31 PM	4	0	6	3	Nest#2-2; Nest#4-1
	Diagonal	**3**	**D2A**	**June 22, 2020**	**06:01:31 PM**	**7**	**0**	**11**	**6**	**New nest beside Nest#3 - a juvenile is very noticeab**
	Diagonal	**3**	**D2B**	**June 22, 2020**	**06:01:31 PM**	**4**	**0**	**4**	**9**	**Nest#2-3; Nest#3-3; Nest#4-3**
	Vertical	3	V1A	June 22, 2020	06:01:31 PM	4	NA	5	NA	na
	Vertical	3	V1B	June 22, 2020	06:01:31 PM	3	NA	3	NA	Might have a new nest on the very top of 3V1B
	Vertical	**3**	**V2A**	**June 22, 2020**	**06:01:31 PM**	**6**	**NA**	**5**	**NA**	**na**
	Vertical	3	V2B	June 22, 2020	06:01:31 PM	4	NA	4	NA	na
	Vertical	3	V2C	June 22, 2020	06:01:31 PM	4	NA	3	NA	na
	Vertical	**3**	**V2D**	**June 22, 2020**	**06:01:31 PM**	**4**	**NA**	**4**	**NA**	**na**
	Horizontal	4	H1A	June 22, 2020	06:01:31 PM	4	NA	3	5	Nest#3-3; Nest#4-2
	Horizontal	**4**	**H1B**	**June 22, 2020**	**06:01:31 PM**	**7**	**0**	**10**	**5**	**Nest#3-2; Nest#4-1; Nest#5-1; Nest#6-1**
	Diagonal	4	D1A	June 22, 2020	06:01:31 PM	5	0	6	8	The last nest is getting smaller; Nest#1-3; Nest#2-1;
	Diagonal	**4**	**D1B**	**June 22, 2020**	**06:01:31 PM**	**4**	**0**	**3**	**6**	**Nests #2, 3, 4 each has 3 juveniles**
	Diagonal	4	D2A	June 22, 2020	06:01:31 PM	4	0	6	5	Nest#1-2; Nest#2-2; Nest#4-1
	Diagonal	4	D2B	June 22, 2020	06:01:31 PM	5	0	7	6	Nests#2, 3, 4 each has 2 juveniles
	Vertical	4	V1A	June 22, 2020	06:01:31 PM	5	NA	4	NA	na
	Vertical	4	V1B	June 22, 2020	06:01:31 PM	6	NA	5	NA	na
	Horizontal	**5**	**H1**	**June 22, 2020**	**06:01:31 PM**	**11**	**0**	**11**	**11**	**Nest#6-3; Nest#7-3; Nest#8-3; Nest#9-2**
	Diagonal	5	D1	June 22, 2020	06:01:31 PM	4	0	4	0	na
	Horizontal	**6**	**H1**	**June 22, 2020**	**06:01:31 PM**	**9**	**0**	**10**	**1**	**Nest#6-1**
	Diagonal	**6**	**D1**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 22, 2020**	**06:01:31 PM**	**9**	**NA**	**5**	**NA**	**na**
	Horizontal	**7**	**H1**	**June 22, 2020**	**06:01:31 PM**	**5**	**0**	**5**	**NA**	**na**
	Diagonal	7	D1	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Vertical	7	V1	June 22, 2020	06:01:31 PM	2	0	2	NA	na
	Horizontal	8	H1	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**Nest is gone as there are no visible sticks on 9H1A**
	Horizontal	**9**	**H1B**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Diagonal	9	D1B	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Vertical	9	V1A	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Vertical	9	V1B	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Diagonal	10	D1A	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Diagonal	10	D1B	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	June 22, 2020	06:01:31 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						96	0	96	65	
TOTAL SUM						171	0	179	109	
TOTAL CHICKS AND ADULTS									288	
	NA - Possible nests could not be counted due to obscured view or obstruction									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 24, 2020**	**06:15:50 PM**	**10**	**0**	**15**	**6**	**Nest#2-2; Nest#8-1; Nest#9-2; Nest#10-1**
	Diagonal	2	D1A	June 24, 2020	06:15:50 PM	5	0	5	8	Nest#2-2; Nest#3-3; Nest#4-3
	Diagonal	**2**	**D1B**	**June 24, 2020**	**06:15:50 PM**	**6**	**0**	**9**	**7**	**na**
	Lower Diagonal	3	LD1A	June 24, 2020	06:15:50 PM	6	NA	9	NA	na
	Lower Diagonal	**3**	**LD1B**	**June 24, 2020**	**06:15:50 PM**	**8**	**NA**	**7**	**NA**	**na**
	Horizontal	**3**	**H1A**	**June 24, 2020**	**06:15:50 PM**	**5**	**NA**	**8**	**7**	**Nest#2-3; Nest#3-3; Nest#5-1**
	Horizontal	3	H1B	June 24, 2020	06:15:50 PM	6	0	6	5	Nest#3-3; Nest#5-2
	Diagonal	3	D1A	June 24, 2020	06:15:50 PM	4	0	7	2	na
	Diagonal	3	D1B	June 24, 2020	06:15:50 PM	4	0	7	4	na
	Diagonal	**3**	**D2A**	**June 24, 2020**	**06:15:50 PM**	**6**	**0**	**7**	**1**	**New nest is gone**
	Diagonal	**3**	**D2B**	**June 24, 2020**	**06:15:50 PM**	**4**	**0**	**8**	**7**	**Nest#2, 3, 4 each has 2 juveniles**
	Vertical	3	V1A	June 24, 2020	06:15:50 PM	4	NA	1	NA	na
	Vertical	3	V1B	June 24, 2020	06:15:50 PM	3	NA	2	NA	na
	Vertical	**3**	**V2A**	**June 24, 2020**	**06:15:50 PM**	**6**	**NA**	**4**	**NA**	**na**
	Vertical	3	V2B	June 24, 2020	06:15:50 PM	4	NA	7	NA	na
	Vertical	3	V2C	June 24, 2020	06:15:50 PM	4	NA	4	NA	na
	Vertical	**3**	**V2D**	**June 24, 2020**	**06:15:50 PM**	**4**	**NA**	**3**	**NA**	**na**
	Horizontal	4	H1A	June 24, 2020	06:15:50 PM	4	0	5	2	Might have a new nest in between 4H1A and 4H1B
	Horizontal	**4**	**H1B**	**June 24, 2020**	**06:15:50 PM**	**6**	**0**	**10**	**NA**	**The new nest is gone**
	Diagonal	4	D1A	June 24, 2020	06:15:50 PM	5	0	9	6	na
	Diagonal	**4**	**D1B**	**June 24, 2020**	**06:15:50 PM**	**4**	**0**	**5**	**5**	**Nest#3-2,;Nest#4-3**
	Diagonal	4	D2A	June 24, 2020	06:15:50 PM	4	0	6	4	na
	Diagonal	4	D2B	June 24, 2020	06:15:50 PM	5	0	6	4	na
	Vertical	4	V1A	June 24, 2020	06:15:50 PM	5	NA	8	NA	na
	Vertical	4	V1B	June 24, 2020	06:15:50 PM	6	NA	6	NA	na
	Horizontal	**5**	**H1**	**June 24, 2020**	**06:15:50 PM**	**11**	**NA**	**14**	**9**	**Nest#6-2; Nest#7-2; Nest#8-2; Nest#9-3**
	Diagonal	5	D1	June 24, 2020	06:15:50 PM	4	0	4	NA	na
	Horizontal	**6**	**H1**	**June 24, 2020**	**06:15:50 PM**	**9**	**NA**	**8**	**1**	**Nest#5 and Nest#6 are higher; Nest#9-1**
	Diagonal	**6**	**D1**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 24, 2020**	**06:15:50 PM**	**9**	**NA**	**5**	**NA**	**na**
	Horizontal	**7**	**H1**	**June 24, 2020**	**06:15:50 PM**	**5**	**0**	**5**	**NA**	**Nest#1 and Nest#2 are higher**
	Diagonal	7	D1	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Vertical	7	V1	June 24, 2020	06:15:50 PM	2	0	2	NA	na
	Horizontal	8	H1	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Diagonal	9	D1B	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Vertical	9	V1A	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Vertical	9	V1B	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Diagonal	10	D1A	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Diagonal	10	D1B	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	June 24, 2020	06:15:50 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						93	0	108	43	
TOTAL SUM						168	0	202	78	
TOTAL CHICKS AND ADULTS									280	
	NA - Possible nests could not be counted due to obscured view or obstruction									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 26, 2020**	**06:14:03 PM**	**10**	**0**	**18**	**4**	**Nest#1-1; Nest#9-3**
	Diagonal	2	D1A	June 26, 2020	06:14:03 PM	5	1	5	8	Nest#1-3; Nest#3-2; Nest#4-3
	Diagonal	**2**	**D1B**	**June 26, 2020**	**06:14:03 PM**	**6**	**0**	**8**	**8**	**Nest#2-3; Nest#4-1; Nest#5-2; Nest#6-2**
	Lower Diagonal	3	LD1A	June 26, 2020	06:14:03 PM	7	NA	4	1	Nest#5-1
	Lower Diagonal	**3**	**LD1B**	**June 26, 2020**	**06:14:03 PM**	**10**	**NA**	**9**	**NA**	**na**
	Horizontal	**3**	**H1A**	**June 26, 2020**	**06:14:03 PM**	**5**	**0**	**6**	**2**	**Nest#2-1; Nest#3-1**
	Horizontal	3	H1B	June 26, 2020	06:14:03 PM	6	0	8	5	Nest#3-2; Nest#4-1; Nest#5-2; Nest#6 has 2 adults'
	Diagonal	3	D1A	June 26, 2020	06:14:03 PM	4	0	3	10	Nest#1-3; Nest#2-4; Nest#3-3
	Diagonal	3	D1B	June 26, 2020	06:14:03 PM	4	0	5	5	Nest#2-2; Nest#4-3
	Diagonal	**3**	**D2A**	**June 26, 2020**	**06:14:03 PM**	**6**	**0**	**9**	**3**	**Nest#2-1; Nest#3-2**
	Diagonal	**3**	**D2B**	**June 26, 2020**	**06:14:03 PM**	**4**	**0**	**7**	**7**	**na**
	Vertical	3	V1A	June 26, 2020	06:14:03 PM	4	NA	1	NA	na
	Vertical	3	V1B	June 26, 2020	06:14:03 PM	3	NA	2	NA	na
	Vertical	**3**	**V2A**	**June 26, 2020**	**06:14:03 PM**	**6**	**NA**	**9**	**NA**	**na**
	Vertical	3	V2B	June 26, 2020	06:14:03 PM	4	NA	2	NA	na
	Vertical	3	V2C	June 26, 2020	06:14:03 PM	4	NA	3	NA	na
	Vertical	**3**	**V2D**	**June 26, 2020**	**06:14:03 PM**	**4**	**NA**	**1**	**NA**	**na**
	Horizontal	4	H1A	June 26, 2020	06:14:03 PM	4	0	2	4	Nest#3-3; Nest#4-1
	Horizontal	**4**	**H1B**	**June 26, 2020**	**06:14:03 PM**	**7**	**0**	**10**	**4**	**Nest#4-1; Juvenile is building nest next to Nest#4; N**
	Diagonal	4	D1A	June 26, 2020	06:14:03 PM	5	0	5	8	Nest#1-2; Nest#2-2; Nest#3-2; Nest#4-2
	Diagonal	**4**	**D1B**	**June 26, 2020**	**06:14:03 PM**	**4**	**0**	**6**	**5**	**Nest#2-2; Nest#3-1; Nest#4-2**
	Diagonal	4	D2A	June 26, 2020	06:14:03 PM	4	0	6	7	Nest#1-2; Nest#2-3; Nest#4-2
	Diagonal	4	D2B	June 26, 2020	06:14:03 PM	5	NA	4	8	Nest#2-3; Nest#3-2; Nest#4-3
	Vertical	4	V1A	June 26, 2020	06:14:03 PM	5	NA	3	NA	na
	Vertical	4	V1B	June 26, 2020	06:14:03 PM	6	NA	3	NA	na
	Horizontal	**5**	**H1**	**June 26, 2020**	**06:14:03 PM**	**11**	**NA**	**16**	**7**	**Nest#5-1; Nest#6-2; Nest#7-1; Nest#8-3; Nest#9-1**
	Diagonal	5	D1	June 26, 2020	06:14:03 PM	4	0	4	NA	na
	Horizontal	**6**	**H1**	**June 26, 2020**	**06:14:03 PM**	**9**	**NA**	**9**	**NA**	**na**
	Diagonal	**6**	**D1**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 26, 2020**	**06:14:03 PM**	**9**	**NA**	**3**	**NA**	**na**
	Horizontal	**7**	**H1**	**June 26, 2020**	**06:14:03 PM**	**5**	**0**	**5**	**NA**	**na**
	Diagonal	7	D1	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Vertical	7	V1	June 26, 2020	06:14:03 PM	2	NA	3	NA	na
	Horizontal	8	H1	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**There might be a new nest under construction**
	Horizontal	**9**	**H1B**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Diagonal	9	D1B	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Vertical	9	V1A	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Vertical	9	V1B	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Diagonal	10	D1A	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Diagonal	10	D1B	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	June 26, 2020	06:14:03 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						96	0	116	40	
TOTAL SUM						172	1	179	96	
TOTAL CHICKS AND ADULTS									275	
	NA - Possible nests could not be counted due to obscured view or obstruction									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 29, 2020**	**05:57:43 PM**	**10**	**0**	**12**	**13**	**Nest#2-1; Nest#3-2, Nest#4-2; Nest#6-1, Nest#7-2 N**
	Diagonal	2	D1A	June 29, 2020	05:57:43 PM	5	0	7	5	Nest#1-3; Nest#2-1; Nest#3-1,
	Diagonal	**2**	**D1B**	**June 29, 2020**	**05:57:43 PM**	**6**	**0**	**10**	**9**	**na**
	Lower Diagonal	3	LD1A	June 29, 2020	05:57:43 PM	7	NA	5	NA	na
	Lower Diagonal	**3**	**LD1B**	**June 29, 2020**	**05:57:43 PM**	**10**	**NA**	**3**	**NA**	**na**
	Horizontal	**3**	**H1A**	**June 29, 2020**	**05:57:43 PM**	**5**	**0**	**6**	**9**	**Nest#2-3; Nest#4-3; Nest#5-3**
	Horizontal	3	H1B	June 29, 2020	05:57:43 PM	6	0	7	3	Nest#3-1; Nest#5-2
	Diagonal	3	D1A	June 29, 2020	05:57:43 PM	4	0	8	4	Nest#1-2; Nest#2-1; Nest#4-1
	Diagonal	3	D1B	June 29, 2020	05:57:43 PM	4	0	5	3	Nest#2-2; Nest#4-1
	Diagonal	**3**	**D2A**	**June 29, 2020**	**05:57:43 PM**	**6**	**0**	**9**	**4**	**Nest#2-1; Nest#3-1; Nest#6-2**
	Diagonal	**3**	**D2B**	**June 29, 2020**	**05:57:43 PM**	**4**	**0**	**8**	**3**	**Nest#2-1; Nest#4-2**
	Vertical	3	V1A	June 29, 2020	05:57:43 PM	4	NA	2	NA	na
	Vertical	3	V1B	June 29, 2020	05:57:43 PM	3	NA	2	NA	na
	Vertical	**3**	**V2A**	**June 29, 2020**	**05:57:43 PM**	**6**	**NA**	**7**	**2**	**Nest above 3V2A has 2 juveniles**
	Vertical	3	V2B	June 29, 2020	05:57:43 PM	4	NA	3	NA	na
	Vertical	3	V2C	June 29, 2020	05:57:43 PM	4	NA	4	NA	na
	Vertical	**3**	**V2D**	**June 29, 2020**	**05:57:43 PM**	**4**	**NA**	**4**	**NA**	**na**
	Horizontal	4	H1A	June 29, 2020	05:57:43 PM	4	NA	4	2	Nest#2-1 (in sitting posture); Nest#2-1
	Horizontal	**4**	**H1B**	**June 29, 2020**	**05:57:43 PM**	**6**	**0**	**9**	**5**	**Nest#4-1; Nest#5-1; Nest#6-1; Nest#7-2**
	Diagonal	4	D1A	June 29, 2020	05:57:43 PM	5	0	9	10	Nest#1-2; Nest#2-2; Nest#3-2; Nest#4-4
	Diagonal	**4**	**D1B**	**June 29, 2020**	**05:57:43 PM**	**4**	**0**	**5**	**8**	**Nest#2-1; Nest#3-3; Nest#4-4**
	Diagonal	4	D2A	June 29, 2020	05:57:43 PM	4	0	7	6	Nest#1-3; Nest#2-2; Nest#4-1
	Diagonal	4	D2B	June 29, 2020	05:57:43 PM	5	0	8	5	Nest#2-3; Nest#4-2
	Vertical	4	V1A	June 29, 2020	05:57:43 PM	5	NA	9	NA	na
	Vertical	4	V1B	June 29, 2020	05:57:43 PM	6	NA	3	NA	na
	Horizontal	**5**	**H1**	**June 29, 2020**	**05:57:43 PM**	**10**	**0**	**12**	**9**	**Nest#11 is gone; Nest#6-3; Nest#8-3; Nest#9-3**
	Diagonal	5	D1	June 29, 2020	05:57:43 PM	4	0	4	0	na
	Horizontal	**6**	**H1**	**June 29, 2020**	**05:57:43 PM**	**9**	**NA**	**10**	**0**	**na**
	Diagonal	**6**	**D1**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 29, 2020**	**05:57:43 PM**	**7**	**NA**	**3**	**NA**	**Nest#5 and Nest#6 are gone**
	Horizontal	**7**	**H1**	**June 29, 2020**	**05:57:43 PM**	**5**	**0**	**5**	**0**	**na**
	Diagonal	7	D1	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Vertical	7	V1	June 29, 2020	05:57:43 PM	2	NA	2	NA	na
	Horizontal	8	H1	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Diagonal	9	D1B	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Vertical	9	V1A	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Vertical	9	V1B	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Diagonal	10	D1A	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Diagonal	10	D1B	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	June 29, 2020	05:57:43 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						92	0	103	62	
TOTAL SUM						168	0	192	100	
TOTAL CHICKS AND ADULTS									292	
	NA - Possible nests could not be counted due to obscured view or obstruction									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**July 3, 2020**	**02:41:38 PM**	**10**	**NA**	**12**	**14**	**Nest#2-1; Nest#3-1; Nest#6-3; Nest#7-2; Nest#8-2; Nest#9-3; Nest#10-2**
	Diagonal	2	D1A	July 3, 2020	02:41:38 PM	5	0	4	10	Nest#1-3; Nest#2-2; Nest#3-2; Nest#4-3
	Diagonal	**2**	**D1B**	**July 3, 2020**	**02:41:38 PM**	**6**	**1**	**8**	**3**	**Nest#3-2; Nest#6-1**
	Lower Diagonal	3	LD1A	July 3, 2020	02:41:38 PM	7	NA	3	1	Nest#4-1
	Lower Diagonal	**3**	**LD1B**	**July 3, 2020**	**02:41:38 PM**	**9**	**NA**	**1**	**NA**	**na**
	Horizontal	**3**	**H1A**	**July 3, 2020**	**02:41:38 PM**	**5**	**NA**	**4**	**8**	**Nest#2-2; Nest#3-4; Nest#4-1; Nest#5-1**
	Horizontal	3	H1B	July 3, 2020	02:41:38 PM	6	0	7	3	Nest#3-3
	Diagonal	3	D1A	July 3, 2020	02:41:38 PM	4	0	4	6	Nest#2-3; Nest#3-3
	Diagonal	3	D1B	July 3, 2020	02:41:38 PM	4	0	6	2	Nest#1-1; Nest#3-1
	Diagonal	**3**	**D2A**	**July 3, 2020**	**02:41:38 PM**	**7**	**0**	**8**	**5**	**Nest#3-3; Nest#7-1; Nest#4 is new (by a juvenile)**
	Diagonal	**3**	**D2B**	**July 3, 2020**	**02:41:38 PM**	**4**	**0**	**7**	**2**	**Nest#2-2**
	Vertical	3	V1A	July 3, 2020	02:41:38 PM	4	NA	1	NA	na
	Vertical	3	V1B	July 3, 2020	02:41:38 PM	3	NA	1	NA	na
	Vertical	**3**	**V2A**	**July 3, 2020**	**02:41:38 PM**	**6**	**NA**	**10**	**NA**	**na**
	Vertical	3	V2B	July 3, 2020	02:41:38 PM	4	NA	3	NA	**na**
	Vertical	3	V2C	July 3, 2020	02:41:38 PM	4	NA	4	NA	**na**
	Vertical	**3**	**V2D**	**July 3, 2020**	**02:41:38 PM**	**4**	**NA**	**2**	**NA**	**na**
	Horizontal	4	H1A	July 3, 2020	02:41:38 PM	4	NA	3	4	Nest#3-3; Nest#4-1
	Horizontal	**4**	**H1B**	**July 3, 2020**	**02:41:38 PM**	**6**	**NA**	**9**	**3**	**Nest#3-1; Nest#4-1; Nest#6-1; The nest juvenile was building was gone**
	Diagonal	4	D1A	July 3, 2020	02:41:38 PM	5	0	7	9	Nest#1-1; Nest#2-3; Nest#3-3; Nest#4-2
	Diagonal	**4**	**D1B**	**July 3, 2020**	**02:41:38 PM**	**4**	**0**	**11**	**0**	**na**
	Diagonal	4	D2A	July 3, 2020	02:41:38 PM	4	0	6	3	Nest#1-1; Nest#2-2
	Diagonal	4	D2B	July 3, 2020	02:41:38 PM	5	NA	6	1	Nest#3-1
	Vertical	4	V1A	July 3, 2020	02:41:38 PM	5	NA	5	NA	na
	Vertical	4	V1B	July 3, 2020	02:41:38 PM	6	NA	9	NA	na
	Horizontal	**5**	**H1**	**July 3, 2020**	**02:41:38 PM**	**10**	**NA**	**17**	**4**	**Nest#6-1; Nest#8-3**
	Diagonal	5	D1	July 3, 2020	02:41:38 PM	4	0	5	NA	na
	Horizontal	**6**	**H1**	**July 3, 2020**	**02:41:38 PM**	**9**	**NA**	**9**	**NA**	**na**
	Diagonal	**6**	**D1**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**July 3, 2020**	**02:41:38 PM**	**7**	**NA**	**3**	**NA**	**One Pelagic Cormorant is roosting next to Double-crested Cormorant nest**
	Horizontal	**7**	**H1**	**July 3, 2020**	**02:41:38 PM**	**5**	**0**	**5**	**NA**	**Nest#1 and Nest#2 are higher**
	Diagonal	7	D1	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Vertical	7	V1	July 3, 2020	02:41:38 PM	2	0	2	NA	na
	Horizontal	8	H1	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Diagonal	9	D1B	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Vertical	9	V1A	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Vertical	9	V1B	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Horizontal	10	H1A	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Horizontal	10	H1B	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Diagonal	10	D1A	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Diagonal	10	D1B	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Vertical	10	V1A	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Vertical	10	V1B	July 3, 2020	02:41:38 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						92	1	106	39	
TOTAL SUM						168	1	182	78	
TOTAL CHICKS AND ADULTS									260	
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	July 8, 2020	04:41:04 PM	0	0	0	0	One cormorant is dead (wing and possibly head observed hanging from the horizontal gusset plate), and presumably a Pelagic Cormorant nest
	Lower Diagonal	2	LD1A	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**July 8, 2020**	**04:41:04 PM**	**10**	**1**	**13**	**9**	**Nest#2-2; Nest#8-2; Nest#9-3; Nest#10-2**
	Diagonal	2	D1A	July 8, 2020	04:41:04 PM	4	0	4	7	Nest#1-2; Nest#2-2; Nest#3-1; Nest#4-2; Nest#5 is gone
	Diagonal	**2**	**D1B**	**July 8, 2020**	**04:41:04 PM**	**5**	**0**	**7**	**4**	**Nest#2-2; Nest#5-2**
	Lower Diagonal	3	LD1A	July 8, 2020	04:41:04 PM	7	NA	8	NA	na
	Lower Diagonal	**3**	**LD1B**	**July 8, 2020**	**04:41:04 PM**	**9**	**NA**	**3**	**NA**	**na**
	Horizontal	**3**	**H1A**	**July 8, 2020**	**04:41:04 PM**	**5**	**1**	**6**	**1**	**Nest#4-1**
	Horizontal	3	H1B	July 8, 2020	04:41:04 PM	6	NA	6	2	Nest#3-2
	Diagonal	3	D1A	July 8, 2020	04:41:04 PM	4	NA	9	2	Nest#2-2
	Diagonal	3	D1B	July 8, 2020	04:41:04 PM	4	NA	8	2	Nest#2-1; Nest#4-1
	Diagonal	**3**	**D2A**	**July 8, 2020**	**04:41:04 PM**	**6**	**1**	**8**	**1**	**Nest#3-1; Nest#4 is gone; The empty nest indicates Nest#1 that might have been abandoned**
	Diagonal	**3**	**D2B**	**July 8, 2020**	**04:41:04 PM**	**5**	**NA**	**8**	**3**	**Nest#2-2; Nest#4-1**
	Vertical	3	V1A	July 8, 2020	04:41:04 PM	4	NA	3	NA	na
	Vertical	3	V1B	July 8, 2020	04:41:04 PM	3	NA	3	NA	na
	Vertical	**3**	**V2A**	**July 8, 2020**	**04:41:04 PM**	**6**	**NA**	**4**	**NA**	**na**
	Vertical	3	V2B	July 8, 2020	04:41:04 PM	4	NA	1	NA	na
	Vertical	3	V2C	July 8, 2020	04:41:04 PM	4	NA	2	NA	na
	Vertical	**3**	**V2D**	**July 8, 2020**	**04:41:04 PM**	**4**	**NA**	**3**	**NA**	**na**
	Horizontal	4	H1A	July 8, 2020	04:41:04 PM	5	NA	6	NA	One nest is on the horizontal gusset plate
	Horizontal	**4**	**H1B**	**July 8, 2020**	**04:41:04 PM**	**6**	**0**	**7**	**2**	**Two juveniles are building nest at the end of 4H1B on the horizontal gusset plate**
	Diagonal	4	D1A	July 8, 2020	04:41:04 PM	5	NA	10	6	Nest#1-2; Nest#3-2; Nest#4-2; There might be one Pelagic Cormorant nest at the beginning of 4D1A
	Diagonal	**4**	**D1B**	**July 8, 2020**	**04:41:04 PM**	**4**	**NA**	**8**	**3**	**Nest#2-2; Nest#4-1**
	Diagonal	4	D2A	July 8, 2020	04:41:04 PM	4	0	7	4	Nest#2-2; Nest#4-2
	Diagonal	4	D2B	July 8, 2020	04:41:04 PM	5	NA	9	2	Nest#4-2
	Vertical	4	V1A	July 8, 2020	04:41:04 PM	5	NA	6	NA	na
	Vertical	4	V1B	July 8, 2020	04:41:04 PM	6	NA	5	NA	na
	Horizontal	**5**	**H1**	**July 8, 2020**	**04:41:04 PM**	**10**	**0**	**11**	**7**	**Nest#5-1; Nest#6-3; Nest#7-1; Nest#8-1**
	Diagonal	5	D1	July 8, 2020	04:41:04 PM	4	0	5	0	na
	Horizontal	**6**	**H1**	**July 8, 2020**	**04:41:04 PM**	**9**	**NA**	**9**	**0**	**na**
	Diagonal	**6**	**D1**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**July 8, 2020**	**04:41:04 PM**	**7**	**NA**	**3**	**NA**	**There might be a nest at the bottom girder**
	Horizontal	**7**	**H1**	**July 8, 2020**	**04:41:04 PM**	**5**	**0**	**5**	**0**	**na**
	Diagonal	7	D1	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Vertical	7	V1	July 8, 2020	04:41:04 PM	2	0	2	NA	na
	Horizontal	8	H1	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Diagonal	9	D1B	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Vertical	9	V1A	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Vertical	9	V1B	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Diagonal	10	D1A	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Diagonal	10	D1B	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	July 8, 2020	04:41:04 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						91	3	95	30	
TOTAL SUM						167	3	189	55	
TOTAL CHICKS AND ADULTS									244	25 cormorants are roosting at the pier and most of them are juveniles identified from their pale bellies and breasts.

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	July 15, 2020	03:52:00 PM	0	0	0	0	One dead cormorant hanging from the cross beam
	Lower Diagonal	2	LD1A	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**July 15, 2020**	**03:52:00 PM**	**10**	**NA**	**12**	**5**	**Nest#3-1; Nest#7-1; Nest#8-1; Nest#9-2**
	Diagonal	2	D1A	July 15, 2020	03:52:00 PM	4	0	11	3	Nest#1-3
	Diagonal	**2**	**D1B**	**July 15, 2020**	**03:52:00 PM**	**5**	**NA**	**6**	**1**	**Nest#2-1**
	Lower Diagonal	3	LD1A	July 15, 2020	03:52:00 PM	7	NA	6	NA	na
	Lower Diagonal	**3**	**LD1B**	**July 15, 2020**	**03:52:00 PM**	**9**	**NA**	**3**	**NA**	**na**
	Horizontal	**3**	**H1A**	**July 15, 2020**	**03:52:00 PM**	**5**	**NA**	**2**	**4**	**Nest#4-2; Nest#5-2**
	Horizontal	3	H1B	July 15, 2020	03:52:00 PM	6	1	6	1	Nest#2-1
	Diagonal	3	D1A	July 15, 2020	03:52:00 PM	4	0	7	0	na
	Diagonal	3	D1B	July 15, 2020	03:52:00 PM	4	NA	6	1	Nest#4-1
	Diagonal	**3**	**D2A**	**July 15, 2020**	**03:52:00 PM**	**6**	**1**	**9**	**0**	**Empty nest indicates Nest#1 might have been aban**
	Diagonal	**3**	**D2B**	**July 15, 2020**	**03:52:00 PM**	**4**	**NA**	**5**	**1**	**Nest#3-1; Nest#5 is gone**
	Vertical	3	V1A	July 15, 2020	03:52:00 PM	4	NA	1	NA	na
	Vertical	3	V1B	July 15, 2020	03:52:00 PM	3	NA	3	NA	Nest#4 is gone
	Vertical	**3**	**V2A**	**July 15, 2020**	**03:52:00 PM**	**5**	**NA**	**8**	**NA**	**Nest#5 is gone**
	Vertical	3	V2B	July 15, 2020	03:52:00 PM	4	NA	3	NA	na
	Vertical	3	V2C	July 15, 2020	03:52:00 PM	4	NA	3	NA	na
	Vertical	**3**	**V2D**	**July 15, 2020**	**03:52:00 PM**	**4**	**NA**	**3**	**NA**	**na**
	Horizontal	4	H1A	July 15, 2020	03:52:00 PM	4	NA	4	2	Nest#2-2
	Horizontal	**4**	**H1B**	**July 15, 2020**	**03:52:00 PM**	**7**	**0**	**7**	**NA**	**Nest#7 located on 4H1B horizontal gusset plate is n**
	Diagonal	4	D1A	July 15, 2020	03:52:00 PM	5	NA	9	NA	na
	Diagonal	**4**	**D1B**	**July 15, 2020**	**03:52:00 PM**	**4**	**NA**	**5**	**1**	**Nest#2-1**
	Diagonal	4	D2A	July 15, 2020	03:52:00 PM	4	1	2	5	Nest#1-2; Nest#3-3
	Diagonal	4	D2B	July 15, 2020	03:52:00 PM	5	NA	7	1	Nest#4-1
	Vertical	4	V1A	July 15, 2020	03:52:00 PM	5	NA	4	NA	na
	Vertical	4	V1B	July 15, 2020	03:52:00 PM	6	NA	4	NA	na
	Horizontal	**5**	**H1**	**July 15, 2020**	**03:52:00 PM**	**9**	**1**	**7**	**3**	**Nest#7 is gone; Nest#8 is empty; Nest#6-3**
	Diagonal	5	D1	July 15, 2020	03:52:00 PM	4	0	7	0	na
	Horizontal	**6**	**H1**	**July 15, 2020**	**03:52:00 PM**	**9**	**NA**	**10**	**0**	**na**
	Diagonal	**6**	**D1**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**July 15, 2020**	**03:52:00 PM**	**7**	**NA**	**4**	**NA**	**na**
	Horizontal	**7**	**H1**	**July 15, 2020**	**03:52:00 PM**	**5**	**0**	**6**	**3**	**Nest#2-3**
	Diagonal	7	D1	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Vertical	7	V1	July 15, 2020	03:52:00 PM	2	0	2	NA	na
	Horizontal	8	H1	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Diagonal	9	D1B	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Vertical	9	V1A	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Vertical	9	V1B	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Diagonal	10	D1A	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Diagonal	10	D1B	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	July 15, 2020	03:52:00 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						89	2	87	18	
TOTAL SUM						164	4	172	31	
TOTAL CHICKS AND ADULTS									203	126 cormorants are roosting at the pier and most of them are juveniles identified from their pale bellies and breasts.

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	July 22, 2020	03:16:03 PM	0	0	0	0	One dead cormorant hanging from the cross beam
	Lower Diagonal	2	LD1A	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**July 22, 2020**	**03:16:03 PM**	**10**	**4**	**11**	**0**	**na**
	Diagonal	2	D1A	July 22, 2020	03:16:03 PM	4	0	7	0	na
	Diagonal	**2**	**D1B**	**July 22, 2020**	**03:16:03 PM**	**5**	**2**	**3**	**2**	**Nest#4-2**
	Lower Diagonal	3	LD1A	July 22, 2020	03:16:03 PM	7	NA	5	NA	na
	Lower Diagonal	**3**	**LD1B**	**July 22, 2020**	**03:16:03 PM**	**9**	**NA**	**3**	**NA**	**na**
	Horizontal	**3**	**H1A**	**July 22, 2020**	**03:16:03 PM**	**5**	**NA**	**4**	**NA**	**na**
	Horizontal	3	H1B	July 22, 2020	03:16:03 PM	6	3	3	NA	na
	Diagonal	3	D1A	July 22, 2020	03:16:03 PM	4	3	NA	NA	na
	Diagonal	3	D1B	July 22, 2020	03:16:03 PM	4	1	2	5	Nest#3-2; Nest#4-3
	Diagonal	**3**	**D2A**	**July 22, 2020**	**03:16:03 PM**	**6**	**3**	**2**	**0**	**Nest#4 is gone**
	Diagonal	**3**	**D2B**	**July 22, 2020**	**03:16:03 PM**	**4**	**3**	**1**	**NA**	**na**
	Vertical	3	V1A	July 22, 2020	03:16:03 PM	4	NA	2	NA	na
	Vertical	3	V1B	July 22, 2020	03:16:03 PM	3	NA	4	NA	na
	Vertical	**3**	**V2A**	**July 22, 2020**	**03:16:03 PM**	**4**	**NA**	**3**	**NA**	**Nest#5 is gone**
	Vertical	3	V2B	July 22, 2020	03:16:03 PM	4	NA	NA	NA	na
	Vertical	3	V2C	July 22, 2020	03:16:03 PM	4	NA	4	NA	na
	Vertical	**3**	**V2D**	**July 22, 2020**	**03:16:03 PM**	**3**	**NA**	**5**	**NA**	**Nest#1 is gone**
	Horizontal	4	H1A	July 22, 2020	03:16:03 PM	4	1	2	NA	na
	Horizontal	**4**	**H1B**	**July 22, 2020**	**03:16:03 PM**	**6**	**2**	**3**	**NA**	**The nest built by the two juveniles is gone.**
	Diagonal	4	D1A	July 22, 2020	03:16:03 PM	5	1	4	NA	na
	Diagonal	**4**	**D1B**	**July 22, 2020**	**03:16:03 PM**	**4**	**1**	**6**	**NA**	**na**
	Diagonal	4	D2A	July 22, 2020	03:16:03 PM	3	1	3	0	Nest#1 is gone
	Diagonal	4	D2B	July 22, 2020	03:16:03 PM	5	1	2	NA	na
	Vertical	4	V1A	July 22, 2020	03:16:03 PM	4	NA	NA	NA	Nest#4 is gone
	Vertical	4	V1B	July 22, 2020	03:16:03 PM	5	NA	2	NA	na
	Horizontal	**5**	**H1**	**July 22, 2020**	**03:16:03 PM**	**9**	**1**	**9**	**5**	**Nest#3-1; Nest#5-2; Nest#9-2**
	Diagonal	5	D1	July 22, 2020	03:16:03 PM	4	0	6	5	Nest#1-2; Nest#2-2; Nest#3-1
	Horizontal	**6**	**H1**	**July 22, 2020**	**03:16:03 PM**	**9**	**NA**	**13**	**2**	**Nest#3 is gone; Nest#9-2**
	Diagonal	**6**	**D1**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**July 22, 2020**	**03:16:03 PM**	**7**	**NA**	**1**	**NA**	**na**
	Horizontal	**7**	**H1**	**July 22, 2020**	**03:16:03 PM**	**5**	**0**	**5**	**5**	**Nest#2-3; Nest#3-2**
	Diagonal	7	D1	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Vertical	7	V1	July 22, 2020	03:16:03 PM	2	0	2	0	na
	Horizontal	8	H1	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Diagonal	9	D1B	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Vertical	9	V1A	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Vertical	9	V1B	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Diagonal	10	D1A	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Diagonal	10	D1B	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	July 22, 2020	03:16:03 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						86	16	69	14	
TOTAL SUM						158	27	117	24	
TOTAL CHICKS AND ADULTS									141	108 cormorants are roosting at the pier and most of them are juveniles identified from their pale bellies and breasts.

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**July 29, 2020**	**02:22:06 PM**	**10**	**4**	**8**	**NA**	**na**
	Diagonal	2	D1A	July 29, 2020	02:22:06 PM	4	1	3	0	na
	Diagonal	**2**	**D1B**	**July 29, 2020**	**02:22:06 PM**	**5**	**3**	**2**	**0**	**na**
	Lower Diagonal	3	LD1A	July 29, 2020	02:22:06 PM	7	NA	1	NA	na
	Lower Diagonal	**3**	**LD1B**	**July 29, 2020**	**02:22:06 PM**	**7**	**NA**	**3**	**NA**	**Nest#1 and Nest#4 are gone**
	Horizontal	**3**	**H1A**	**July 29, 2020**	**02:22:06 PM**	**5**	**2**	**1**	**0**	**na**
	Horizontal	3	H1B	July 29, 2020	02:22:06 PM	6	3	4	3	Nest#2-3
	Diagonal	3	D1A	July 29, 2020	02:22:06 PM	2	2	NA	NA	na
	Diagonal	3	D1B	July 29, 2020	02:22:06 PM	4	2	2	NA	na
	Diagonal	**3**	**D2A**	**July 29, 2020**	**02:22:06 PM**	**5**	**4**	**1**	**0**	**na**
	Diagonal	**3**	**D2B**	**July 29, 2020**	**02:22:06 PM**	**4**	**3**	**1**	**0**	**na**
	Vertical	3	V1A	July 29, 2020	02:22:06 PM	4	NA	1	NA	na
	Vertical	3	V1B	July 29, 2020	02:22:06 PM	3	NA	NA	NA	na
	Vertical	**3**	**V2A**	**July 29, 2020**	**02:22:06 PM**	**4**	**NA**	**1**	**NA**	**na**
	Vertical	3	V2B	July 29, 2020	02:22:06 PM	4	NA	1	NA	na
	Vertical	3	V2C	July 29, 2020	02:22:06 PM	4	NA	2	NA	na
	Vertical	**3**	**V2D**	**July 29, 2020**	**02:22:06 PM**	**3**	**NA**	**2**	**NA**	**na**
	Horizontal	4	H1A	July 29, 2020	02:22:06 PM	3	1	1	NA	Nest#3 is gone
	Horizontal	**4**	**H1B**	**July 29, 2020**	**02:22:06 PM**	**6**	**2**	**3**	**NA**	**The nest built by the two juveniles might be gone or**
	Diagonal	4	D1A	July 29, 2020	02:22:06 PM	5	5	0	0	na
	Diagonal	**4**	**D1B**	**July 29, 2020**	**02:22:06 PM**	**4**	**2**	**2**	**0**	**na**
	Diagonal	4	D2A	July 29, 2020	02:22:06 PM	3	1	2	0	na
	Diagonal	4	D2B	July 29, 2020	02:22:06 PM	4	2	NA	NA	Nest#2 is gone
	Vertical	4	V1A	July 29, 2020	02:22:06 PM	4	NA	NA	NA	na
	Vertical	4	V1B	July 29, 2020	02:22:06 PM	5	NA	3	NA	na
	Horizontal	**5**	**H1**	**July 29, 2020**	**02:22:06 PM**	**9**	**3**	**9**	**6**	**Nest#3-2; Nest#4-2; Nest#5-2**
	Diagonal	5	D1	July 29, 2020	02:22:06 PM	4	0	10	2	Nest#3-2
	Horizontal	**6**	**H1**	**July 29, 2020**	**02:22:06 PM**	**8**	**NA**	**12**	**4**	**Nest#8-2; Nest#9-2**
	Diagonal	**6**	**D1**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**July 29, 2020**	**02:22:06 PM**	**7**	**1**	**1**	**NA**	**na**
	Horizontal	**7**	**H1**	**July 29, 2020**	**02:22:06 PM**	**5**	**0**	**7**	**1**	**Nest#2-1**
	Diagonal	7	D1	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Vertical	7	V1	July 29, 2020	02:22:06 PM	2	0	3	NA	na
	Horizontal	8	H1	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Diagonal	9	D1B	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Vertical	9	V1A	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Vertical	9	V1B	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Diagonal	10	D1A	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Diagonal	10	D1B	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	July 29, 2020	02:22:06 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						82	24	53	11	
TOTAL SUM						150	41	86	16	
TOTAL CHICKS AND ADULTS									102	119 cormorants are roosting at the pier and most of them are juveniles identified from their pale bellies and breasts.

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**August 3, 2020**	**03:16:31 PM**	**10**	**7**	**2**	**0**	**na**
	Diagonal	2	D1A	August 3, 2020	03:16:31 PM	3	3	0	0	Nest#2 is gone
	Diagonal	**2**	**D1B**	**August 3, 2020**	**03:16:31 PM**	**5**	**4**	**2**	**0**	**na**
	Lower Diagonal	3	LD1A	August 3, 2020	03:16:31 PM	7	NA	1	NA	na
	Lower Diagonal	**3**	**LD1B**	**August 3, 2020**	**03:16:31 PM**	**7**	**NA**	**3**	**NA**	**na**
	Horizontal	**3**	**H1A**	**August 3, 2020**	**03:16:31 PM**	**5**	**2**	**2**	**NA**	**na**
	Horizontal	3	H1B	August 3, 2020	03:16:31 PM	5	2	7	0	na
	Diagonal	3	D1A	August 3, 2020	03:16:31 PM	1	0	1	0	Nest#1 is gone
	Diagonal	3	D1B	August 3, 2020	03:16:31 PM	4	2	2	1	Nest#3-1 (small chicks)
	Diagonal	**3**	**D2A**	**August 3, 2020**	**03:16:31 PM**	**5**	**4**	**1**	**2**	**Nest#4-2 (small chicks)**
	Diagonal	**3**	**D2B**	**August 3, 2020**	**03:16:31 PM**	**4**	**4**	**0**	**0**	**na**
	Vertical	3	V1A	August 3, 2020	03:16:31 PM	4	NA	NA	NA	na
	Vertical	3	V1B	August 3, 2020	03:16:31 PM	3	NA	NA	NA	na
	Vertical	**3**	**V2A**	**August 3, 2020**	**03:16:31 PM**	**4**	**NA**	**1**	**NA**	**na**
	Vertical	3	V2B	August 3, 2020	03:16:31 PM	4	NA	1	NA	na
	Vertical	3	V2C	August 3, 2020	03:16:31 PM	4	NA	1	NA	na
	Vertical	**3**	**V2D**	**August 3, 2020**	**03:16:31 PM**	**3**	**NA**	**2**	**NA**	**na**
	Horizontal	4	H1A	August 3, 2020	03:16:31 PM	3	NA	1	1	Nest#2-1
	Horizontal	**4**	**H1B**	**August 3, 2020**	**03:16:31 PM**	**5**	**3**	**2**	**NA**	**na**
	Diagonal	4	D1A	August 3, 2020	03:16:31 PM	3	3	0	0	Nest#3 and Nest#5 are gone
	Diagonal	**4**	**D1B**	**August 3, 2020**	**03:16:31 PM**	**2**	**1**	**1**	**0**	**Nest#1 and Nest#4 are gone**
	Diagonal	4	D2A	August 3, 2020	03:16:31 PM	2	0	2	1	Nest#2-1; Nest#1 is gone
	Diagonal	4	D2B	August 3, 2020	03:16:31 PM	4	3	NA	NA	na
	Vertical	4	V1A	August 3, 2020	03:16:31 PM	4	NA	NA	NA	na
	Vertical	4	V1B	August 3, 2020	03:16:31 PM	5	NA	1	NA	na
	Horizontal	**5**	**H1**	**August 3, 2020**	**03:16:31 PM**	**9**	**2**	**9**	**8**	**Nest#3-3; Nest#4-1; Nest#5-1; Nest#8-1; Nest#9-2**
	Diagonal	5	D1	August 3, 2020	03:16:31 PM	4	0	11	1	Nest#3-1
	Horizontal	**6**	**H1**	**August 3, 2020**	**03:16:31 PM**	**8**	**NA**	**13**	**5**	**Nest#3-1; Nest#5-2; Nest#6-2**
	Diagonal	**6**	**D1**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**August 3, 2020**	**03:16:31 PM**	**6**	**NA**	**1**	**NA**	**na**
	Horizontal	**7**	**H1**	**August 3, 2020**	**03:16:31 PM**	**5**	**0**	**12**	**0**	**na**
	Diagonal	7	D1	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Vertical	7	V1	August 3, 2020	03:16:31 PM	2	0	4	1	Nest#1-1
	Horizontal	8	H1	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Diagonal	9	D1B	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Vertical	9	V1A	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Vertical	9	V1B	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Diagonal	10	D1A	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Diagonal	10	D1B	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	August 3, 2020	03:16:31 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						78	27	51	15	
TOTAL SUM						140	40	83	20	
TOTAL CHICKS AND ADULTS									103	68 cormorants are roosting at the pier and most of them are juveniles identified from their pale bellies and breasts.
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**August 10, 2020**	**04:16:19 PM**	**10**	**8**	**1**	**0**	**na**
	Diagonal	2	D1A	August 10, 2020	04:16:19 PM	2	1	1	0	Nest#3 is gone
	Diagonal	**2**	**D1B**	**August 10, 2020**	**04:16:19 PM**	**4**	**2**	**1**	**0**	**na**
	Lower Diagonal	3	LD1A	August 10, 2020	04:16:19 PM	7	NA	1	NA	na
	Lower Diagonal	**3**	**LD1B**	**August 10, 2020**	**04:16:19 PM**	**6**	**NA**	**0**	**NA**	**Nest#3 is gone**
	Horizontal	**3**	**H1A**	**August 10, 2020**	**04:16:19 PM**	**5**	**2**	**2**	**NA**	**na**
	Horizontal	3	H1B	August 10, 2020	04:16:19 PM	4	2	4	NA	Nest#4 is gone
	Diagonal	3	D1A	August 10, 2020	04:16:19 PM	0	0	0	0	All the nests are gone
	Diagonal	3	D1B	August 10, 2020	04:16:19 PM	4	2	1	NA	na
	Diagonal	**3**	**D2A**	**August 10, 2020**	**04:16:19 PM**	**4**	**3**	**3**	**0**	**Nest#3 is gone**
	Diagonal	**3**	**D2B**	**August 10, 2020**	**04:16:19 PM**	**4**	**4**	**0**	**0**	**na**
	Vertical	3	V1A	August 10, 2020	04:16:19 PM	4	NA	1	NA	na
	Vertical	3	V1B	August 10, 2020	04:16:19 PM	2	NA	NA	NA	Nest#1 is gone
	Vertical	**3**	**V2A**	**August 10, 2020**	**04:16:19 PM**	**4**	**NA**	**1**	**NA**	**na**
	Vertical	3	V2B	August 10, 2020	04:16:19 PM	4	NA	NA	NA	na
	Vertical	3	V2C	August 10, 2020	04:16:19 PM	4	NA	1	NA	na
	Vertical	**3**	**V2D**	**August 10, 2020**	**04:16:19 PM**	**3**	**NA**	**1**	**NA**	**na**
	Horizontal	4	H1A	August 10, 2020	04:16:19 PM	2	NA	1	2	Nest#3 is gone; Nest#2-2
	Horizontal	**4**	**H1B**	**August 10, 2020**	**04:16:19 PM**	**5**	**4**	**1**	**0**	**na**
	Diagonal	4	D1A	August 10, 2020	04:16:19 PM	2	2	0	0	Nest#3-2
	Diagonal	**4**	**D1B**	**August 10, 2020**	**04:16:19 PM**	**2**	**2**	**0**	**0**	**na**
	Diagonal	4	D2A	August 10, 2020	04:16:19 PM	2	1	2	0	na
	Diagonal	4	D2B	August 10, 2020	04:16:19 PM	4	2	NA	NA	na
	Vertical	4	V1A	August 10, 2020	04:16:19 PM	4	NA	NA	NA	na
	Vertical	4	V1B	August 10, 2020	04:16:19 PM	5	NA	NA	NA	na
	Horizontal	**5**	**H1**	**August 10, 2020**	**04:16:19 PM**	**9**	**3**	**8**	**7**	**Nest#3-3; Nest#5-2; Nest#9-2**
	Diagonal	5	D1	August 10, 2020	04:16:19 PM	4	0	10	4	Nest#3-3; Nest#4-1
	Horizontal	**6**	**H1**	**August 10, 2020**	**04:16:19 PM**	**9**	**0**	**15**	**3**	**Nest#4-1; Nest#6-2**
	Diagonal	**6**	**D1**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**Might have a new family in the left corner**
	Vertical	**6**	**V1**	**August 10, 2020**	**04:16:19 PM**	**6**	**NA**	**2**	**NA**	**na**
	Horizontal	**7**	**H1**	**August 10, 2020**	**04:16:19 PM**	**5**	**0**	**8**	**2**	**Nest#4-2**
	Diagonal	7	D1	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Vertical	7	V1	August 10, 2020	04:16:19 PM	2	0	2	2	Nest#1-2
	Horizontal	8	H1	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Diagonal	9	D1B	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Vertical	9	V1A	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Vertical	9	V1B	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Diagonal	10	D1A	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Diagonal	10	D1B	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	August 10, 2020	04:16:19 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						76	28	43	12	
TOTAL SUM						132	38	67	20	
TOTAL CHICKS AND ADULTS									87	62 cormorants are roosting at the pier and most of them are juveniles identified from their pale bellies and breasts.
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**August 17, 2020**	**04:09:38 PM**	**7**	**4**	**2**	**3**	**Nest#2-1, Nest#5-2; Nest#4 ,#6, #7 are gone**
	Diagonal	2	D1A	August 17, 2020	04:09:38 PM	2	0	0	0	na
	Diagonal	**2**	**D1B**	**August 17, 2020**	**04:09:38 PM**	**4**	**3**	**1**	**2**	**Nest#3-2**
	Lower Diagonal	3	LD1A	August 17, 2020	04:09:38 PM	7	NA	1	1	Nest#3-1
	Lower Diagonal	**3**	**LD1B**	**August 17, 2020**	**04:09:38 PM**	**4**	**NA**	**NA**	**NA**	**Nest#6 and Nest#7 are gone**
	Horizontal	**3**	**H1A**	**August 17, 2020**	**04:09:38 PM**	**5**	**2**	**2**	**2**	**Nest#5-2**
	Horizontal	3	H1B	August 17, 2020	04:09:38 PM	4	3	2	0	na
	Diagonal	3	D1A	August 17, 2020	04:09:38 PM	0	0	0	0	
	Diagonal	3	D1B	August 17, 2020	04:09:38 PM	4	3	1	1	Nest#3-1
	Diagonal	**3**	**D2A**	**August 17, 2020**	**04:09:38 PM**	**3**	**2**	**1**	**2**	**Nest#2 is gone; Nest#3-2**
	Diagonal	**3**	**D2B**	**August 17, 2020**	**04:09:38 PM**	**4**	**4**	**0**	**0**	**na**
	Vertical	3	V1A	August 17, 2020	04:09:38 PM	3	0	3	NA	na
	Vertical	3	V1B	August 17, 2020	04:09:38 PM	2	NA	NA	NA	na
	Vertical	**3**	**V2A**	**August 17, 2020**	**04:09:38 PM**	**4**	**NA**	**1**	**NA**	**na**
	Vertical	3	V2B	August 17, 2020	04:09:38 PM	4	NA	NA	NA	na
	Vertical	3	V2C	August 17, 2020	04:09:38 PM	2	NA	2	NA	Nest#2 and Nest#3 are gone
	Vertical	**3**	**V2D**	**August 17, 2020**	**04:09:38 PM**	**3**	**NA**	**3**	**NA**	**na**
	Horizontal	4	H1A	August 17, 2020	04:09:38 PM	2	NA	3	NA	na
	Horizontal	**4**	**H1B**	**August 17, 2020**	**04:09:38 PM**	**5**	**5**	**0**	**0**	**Nest#1 and Nest#3 - nest debris**
	Diagonal	4	D1A	August 17, 2020	04:09:38 PM	2	2	0	0	na
	Diagonal	**4**	**D1B**	**August 17, 2020**	**04:09:38 PM**	**2**	**2**	**0**	**0**	**na**
	Diagonal	4	D2A	August 17, 2020	04:09:38 PM	2	1	1	3	Nest#1-3
	Diagonal	4	D2B	August 17, 2020	04:09:38 PM	4	3	NA	NA	na
	Vertical	4	V1A	August 17, 2020	04:09:38 PM	4	NA	NA	NA	na
	Vertical	4	V1B	August 17, 2020	04:09:38 PM	4	NA	1	NA	Nest#3 is gone; Nest#2 is merely hanging from the e
	Horizontal	**5**	**H1**	**August 17, 2020**	**04:09:38 PM**	**8**	**3**	**6**	**4**	**Nest#3 is gone; Nest#4-3; Nest#9-1**
	Diagonal	5	D1	August 17, 2020	04:09:38 PM	3	0	7	0	Nest#3 is gone
	Horizontal	**6**	**H1**	**August 17, 2020**	**04:09:38 PM**	**8**	**NA**	**7**	**9**	**Nest#1-1, Nest#4-2, Nest#5-2; Nest#7-1; Nest#8-3**
	Diagonal	**6**	**D1**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**August 17, 2020**	**04:09:38 PM**	**6**	**NA**	**3**	**NA**	**na**
	Horizontal	**7**	**H1**	**August 17, 2020**	**04:09:38 PM**	**5**	**0**	**3**	**6**	**Nest#1-1; A juvenile at Nest#3 (wing spread); Nest#**
	Diagonal	7	D1	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Vertical	7	V1	August 17, 2020	04:09:38 PM	2	NA	1	NA	na
	Horizontal	8	H1	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Diagonal	9	D1B	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Vertical	9	V1A	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Vertical	9	V1B	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Diagonal	10	D1A	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Diagonal	10	D1B	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	August 17, 2020	04:09:38 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						68	25	29	28	
TOTAL SUM						119	37	51	33	
TOTAL CHICKS AND ADULTS									84	35 cormorants are roosting at the pier and most of them are juveniles identified from their pale bellies and breasts.
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**August 24, 2020**	**01:47:42 PM**	**7**	**5**	**1**	**3**	**Nest#5-3**
	Diagonal	2	D1A	August 24, 2020	01:47:42 PM	2	2	0	0	na
	Diagonal	**2**	**D1B**	**August 24, 2020**	**01:47:42 PM**	**4**	**4**	**0**	**0**	**na**
	Lower Diagonal	3	LD1A	August 24, 2020	01:47:42 PM	7	NA	2	NA	na
	Lower Diagonal	**3**	**LD1B**	**August 24, 2020**	**01:47:42 PM**	**4**	**NA**	**1**	**NA**	**na**
	Horizontal	**3**	**H1A**	**August 24, 2020**	**01:47:42 PM**	**5**	**2**	**2**	**2**	**Nest#5-2**
	Horizontal	3	H1B	August 24, 2020	01:47:42 PM	4	3	2	NA	na
	Diagonal	3	D1A	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Diagonal	3	D1B	August 24, 2020	01:47:42 PM	4	3	2	0	na
	Diagonal	**3**	**D2A**	**August 24, 2020**	**01:47:42 PM**	**3**	**2**	**2**	**0**	**na**
	Diagonal	**3**	**D2B**	**August 24, 2020**	**01:47:42 PM**	**4**	**4**	**0**	**0**	**na**
	Vertical	3	V1A	August 24, 2020	01:47:42 PM	3	NA	3	NA	na
	Vertical	3	V1B	August 24, 2020	01:47:42 PM	2	NA	NA	NA	na
	Vertical	**3**	**V2A**	**August 24, 2020**	**01:47:42 PM**	**4**	**NA**	**3**	**NA**	**na**
	Vertical	3	V2B	August 24, 2020	01:47:42 PM	4	NA	NA	NA	na
	Vertical	3	V2C	August 24, 2020	01:47:42 PM	2	NA	NA	NA	na
	Vertical	**3**	**V2D**	**August 24, 2020**	**01:47:42 PM**	**3**	**NA**	**NA**	**NA**	**na**
	Horizontal	4	H1A	August 24, 2020	01:47:42 PM	2	NA	2	1	Nest#2-1
	Horizontal	**4**	**H1B**	**August 24, 2020**	**01:47:42 PM**	**3**	**3**	**0**	**0**	**na**
	Diagonal	4	D1A	August 24, 2020	01:47:42 PM	2	2	0	0	na
	Diagonal	**4**	**D1B**	**August 24, 2020**	**01:47:42 PM**	**2**	**0**	**1**	**2**	**Nest#1-2**
	Diagonal	4	D2A	August 24, 2020	01:47:42 PM	2	1	3	0	na
	Diagonal	4	D2B	August 24, 2020	01:47:42 PM	4	4	0	0	na
	Vertical	4	V1A	August 24, 2020	01:47:42 PM	4	NA	NA	NA	na
	Vertical	4	V1B	August 24, 2020	01:47:42 PM	2	NA	NA	NA	na
	Horizontal	**5**	**H1**	**August 24, 2020**	**01:47:42 PM**	**8**	**4**	**6**	**1**	**Nest#5-1**
	Diagonal	5	D1	August 24, 2020	01:47:42 PM	3	1	3	0	na
	Horizontal	**6**	**H1**	**August 24, 2020**	**01:47:42 PM**	**8**	**1**	**6**	**3**	**Nest#5-1; Nest#6-1; Nest#7-1**
	Diagonal	**6**	**D1**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**August 24, 2020**	**01:47:42 PM**	**6**	**NA**	**2**	**NA**	**na**
	Horizontal	**7**	**H1**	**August 24, 2020**	**01:47:42 PM**	**5**	**2**	**5**	**0**	**na**
	Diagonal	7	D1	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Vertical	7	V1	August 24, 2020	01:47:42 PM	2	NA	NA	NA	na
	Horizontal	8	H1	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**There might be a ROPI nest in the cavity within the**
	Diagonal	9	D1A	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Diagonal	9	D1B	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Vertical	9	V1A	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Vertical	9	V1B	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Diagonal	10	D1A	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Diagonal	10	D1B	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	August 24, 2020	01:47:42 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						66	27	29	11	
TOTAL SUM						115	43	46	12	
TOTAL CHICKS AND ADULTS									58	40 cormorants are roosting at the pier and most of them are juveniles identified from their pale bellies and breasts.
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**August 28, 2020**	**03:16:46 PM**	**7**	**5**	**1**	**2**	**Nest#5-2**
	Diagonal	2	D1A	August 28, 2020	03:16:46 PM	1	1	0	0	Nest#1 is gone
	Diagonal	**2**	**D1B**	**August 28, 2020**	**03:16:46 PM**	**4**	**4**	**0**	**0**	**na**
	Lower Diagonal	3	LD1A	August 28, 2020	03:16:46 PM	7	NA	5	NA	na
	Lower Diagonal	**3**	**LD1B**	**August 28, 2020**	**03:16:46 PM**	**3**	**NA**	**NA**	**NA**	**Nest#4 is gone**
	Horizontal	**3**	**H1A**	**August 28, 2020**	**03:16:46 PM**	**5**	**1**	**5**	**1**	**Nest#3-1**
	Horizontal	3	H1B	August 28, 2020	03:16:46 PM	4	2	1	1	Nest#2-1
	Diagonal	3	D1A	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Diagonal	3	D1B	August 28, 2020	03:16:46 PM	4	NA	3	0	na
	Diagonal	**3**	**D2A**	**August 28, 2020**	**03:16:46 PM**	**3**	**2**	**2**	**0**	**na**
	Diagonal	**3**	**D2B**	**August 28, 2020**	**03:16:46 PM**	**4**	**3**	**2**	**0**	**na**
	Vertical	3	V1A	August 28, 2020	03:16:46 PM	3	NA	1	NA	na
	Vertical	3	V1B	August 28, 2020	03:16:46 PM	2	NA	NA	NA	na
	Vertical	**3**	**V2A**	**August 28, 2020**	**03:16:46 PM**	**4**	**NA**	**1**	**NA**	**na**
	Vertical	3	V2B	August 28, 2020	03:16:46 PM	4	NA	NA	NA	na
	Vertical	3	V2C	August 28, 2020	03:16:46 PM	2	NA	NA	NA	na
	Vertical	**3**	**V2D**	**August 28, 2020**	**03:16:46 PM**	**3**	**NA**	**NA**	**NA**	**na**
	Horizontal	4	H1A	August 28, 2020	03:16:46 PM	2	NA	2	0	na
	Horizontal	**4**	**H1B**	**August 28, 2020**	**03:16:46 PM**	**3**	**3**	**0**	**0**	**na**
	Diagonal	4	D1A	August 28, 2020	03:16:46 PM	2	2	0	0	na
	Diagonal	**4**	**D1B**	**August 28, 2020**	**03:16:46 PM**	**1**	**1**	**0**	**0**	**Nest#1 is left with debris (fishing line and hook)**
	Diagonal	4	D2A	August 28, 2020	03:16:46 PM	2	1	3	0	na
	Diagonal	4	D2B	August 28, 2020	03:16:46 PM	4	4	0	0	na
	Vertical	4	V1A	August 28, 2020	03:16:46 PM	4	NA	NA	NA	na
	Vertical	4	V1B	August 28, 2020	03:16:46 PM	2	NA	NA	NA	na
	Horizontal	**5**	**H1**	**August 28, 2020**	**03:16:46 PM**	**6**	**3**	**4**	**0**	**Nest#5 and Nest#7 are gone; Nest#8 is getting smal**
	Diagonal	5	D1	August 28, 2020	03:16:46 PM	3	2	2	0	na
	Horizontal	**6**	**H1**	**August 28, 2020**	**03:16:46 PM**	**8**	**3**	**1**	**5**	**Nest#7 is gone; Nest#4-1; Nest#5-2; Nest#6-1**
	Diagonal	**6**	**D1**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**August 28, 2020**	**03:16:46 PM**	**6**	**NA**	**2**	**NA**	**na**
	Horizontal	**7**	**H1**	**August 28, 2020**	**03:16:46 PM**	**4**	**2**	**2**	**1**	**Nest#3 is gone; Nest#4-1**
	Diagonal	7	D1	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Vertical	7	V1	August 28, 2020	03:16:46 PM	2	NA	NA	NA	na
	Horizontal	8	H1	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Diagonal	9	D1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Vertical	9	V1A	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Vertical	9	V1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Diagonal	10	D1A	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Diagonal	10	D1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						61	27	20	9	
TOTAL SUM						109	39	37	10	
TOTAL CHICKS AND ADULTS									47	15 cormorants are roosting at the pier and most of them are juveniles identified from their pale bellies and breasts.
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**September 2, 2020**	**12:43:11 PM**	**7**	**4**	**0**	**4**	**Nest#8-1**
	Diagonal	2	D1A	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Diagonal	**2**	**D1B**	**September 2, 2020**	**12:43:11 PM**	**3**	**3**	**0**	**0**	**Nest#4 is gone**
	Lower Diagonal	3	LD1A	September 2, 2020	12:43:11 PM	7	NA	3	NA	na
	Lower Diagonal	**3**	**LD1B**	**September 2, 2020**	**12:43:11 PM**	**3**	**NA**	**1**	**NA**	**na**
	Horizontal	**3**	**H1A**	**September 2, 2020**	**12:43:11 PM**	**5**	**0**	**5**	**2**	**Nest#5-2**
	Horizontal	3	H1B	September 2, 2020	12:43:11 PM	4	4	0	0	na
	Diagonal	3	D1A	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Diagonal	3	D1B	September 2, 2020	12:43:11 PM	4	4	0	0	na
	Diagonal	**3**	**D2A**	**September 2, 2020**	**12:43:11 PM**	**3**	**1**	**2**	**0**	**na**
	Diagonal	**3**	**D2B**	**September 2, 2020**	**12:43:11 PM**	**4**	**4**	**0**	**0**	**na**
	Vertical	3	V1A	September 2, 2020	12:43:11 PM	2	NA	1	NA	Nest#3 is gone
	Vertical	3	V1B	September 2, 2020	12:43:11 PM	2	NA	NA	NA	na
	Vertical	**3**	**V2A**	**September 2, 2020**	**12:43:11 PM**	**4**	**NA**	**NA**	**NA**	**na**
	Vertical	3	V2B	September 2, 2020	12:43:11 PM	4	NA	NA	NA	na
	Vertical	3	V2C	September 2, 2020	12:43:11 PM	2	NA	NA	NA	na
	Vertical	**3**	**V2D**	**September 2, 2020**	**12:43:11 PM**	**3**	**NA**	**NA**	**NA**	**na**
	Horizontal	4	H1A	September 2, 2020	12:43:11 PM	2	NA	1	0	na
	Horizontal	**4**	**H1B**	**September 2, 2020**	**12:43:11 PM**	**3**	**3**	**0**	**0**	**na**
	Diagonal	4	D1A	September 2, 2020	12:43:11 PM	2	1	1	0	na
	Diagonal	**4**	**D1B**	**September 2, 2020**	**12:43:11 PM**	**1**	**1**	**0**	**0**	**na**
	Diagonal	4	D2A	September 2, 2020	12:43:11 PM	2	1	3	0	na
	Diagonal	4	D2B	September 2, 2020	12:43:11 PM	4	4	0	0	na
	Vertical	4	V1A	September 2, 2020	12:43:11 PM	3	NA	NA	NA	Nest#4 is gone
	Vertical	4	V1B	September 2, 2020	12:43:11 PM	2	NA	NA	NA	na
	Horizontal	**5**	**H1**	**September 2, 2020**	**12:43:11 PM**	**5**	**3**	**0**	**2**	**Nest#6 is gone; Nest#2-2**
	Diagonal	5	D1	September 2, 2020	12:43:11 PM	2	2	0	0	Nest#2 is gone
	Horizontal	**6**	**H1**	**September 2, 2020**	**12:43:11 PM**	**7**	**5**	**2**	**1**	**Nest#5-1**
	Diagonal	**6**	**D1**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**September 2, 2020**	**12:43:11 PM**	**5**	**NA**	**1**	**NA**	**Nest#4 is gone**
	Horizontal	**7**	**H1**	**September 2, 2020**	**12:43:11 PM**	**4**	**3**	**2**	**1**	**Nest#3 -1**
	Diagonal	7	D1	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Vertical	7	V1	September 2, 2020	12:43:11 PM	2	NA	NA	NA	na
	Horizontal	8	H1	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Diagonal	9	D1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Vertical	9	V1A	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Vertical	9	V1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Diagonal	10	D1A	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Diagonal	10	D1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						57	27	13	10	
TOTAL SUM						101	43	22	10	
TOTAL CHICKS AND ADULTS									32	28 cormorants are roosting at the pier and most of them are juveniles identified from their pale bellies and breasts.
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**September 9, 2020**	**02:00:38 PM**	**7**	**5**	**2**	**NA**	**na**
	Diagonal	2	D1A	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Diagonal	**2**	**D1B**	**September 9, 2020**	**02:00:38 PM**	**3**	**3**	**0**	**0**	**na**
	Lower Diagonal	3	LD1A	September 9, 2020	02:00:38 PM	7	NA	NA	NA	na
	Lower Diagonal	**3**	**LD1B**	**September 9, 2020**	**02:00:38 PM**	**2**	**NA**	**NA**	**NA**	**na**
	Horizontal	**3**	**H1A**	**September 9, 2020**	**02:00:38 PM**	**5**	**2**	**4**	**1**	**na**
	Horizontal	3	H1B	September 9, 2020	02:00:38 PM	4	4	0	0	na
	Diagonal	3	D1A	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Diagonal	3	D1B	September 9, 2020	02:00:38 PM	4	4	0	0	na
	Diagonal	**3**	**D2A**	**September 9, 2020**	**02:00:38 PM**	**3**	**2**	**1**	**0**	**na**
	Diagonal	**3**	**D2B**	**September 9, 2020**	**02:00:38 PM**	**4**	**4**	**0**	**0**	**na**
	Vertical	3	V1A	September 9, 2020	02:00:38 PM	2	NA	2	NA	na
	Vertical	3	V1B	September 9, 2020	02:00:38 PM	2	NA	NA	NA	na
	Vertical	**3**	**V2A**	**September 9, 2020**	**02:00:38 PM**	**4**	**NA**	**NA**	**NA**	**na**
	Vertical	3	V2B	September 9, 2020	02:00:38 PM	4	NA	NA	NA	na
	Vertical	3	V2C	September 9, 2020	02:00:38 PM	2	NA	NA	NA	na
	Vertical	**3**	**V2D**	**September 9, 2020**	**02:00:38 PM**	**3**	**NA**	**NA**	**NA**	**na**
	Horizontal	4	H1A	September 9, 2020	02:00:38 PM	2	NA	1	0	na
	Horizontal	**4**	**H1B**	**September 9, 2020**	**02:00:38 PM**	**3**	**3**	**0**	**0**	**na**
	Diagonal	4	D1A	September 9, 2020	02:00:38 PM	2	2	0	0	na
	Diagonal	**4**	**D1B**	**September 9, 2020**	**02:00:38 PM**	**1**	**1**	**0**	**0**	**na**
	Diagonal	4	D2A	September 9, 2020	02:00:38 PM	2	1	2	0	The two birds might be juveniles
	Diagonal	4	D2B	September 9, 2020	02:00:38 PM	4	3	0	0	na
	Vertical	4	V1A	September 9, 2020	02:00:38 PM	3	NA	NA	NA	na
	Vertical	4	V1B	September 9, 2020	02:00:38 PM	2	NA	NA	NA	na
	Horizontal	**5**	**H1**	**September 9, 2020**	**02:00:38 PM**	**5**	**3**	**1**	**NA**	**na**
	Diagonal	5	D1	September 9, 2020	02:00:38 PM	2	2	0	0	na
	Horizontal	**6**	**H1**	**September 9, 2020**	**02:00:38 PM**	**7**	**5**	**0**	**3**	**Nest#6-1; Nest#7-2**
	Diagonal	**6**	**D1**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**September 9, 2020**	**02:00:38 PM**	**4**	**NA**	**2**	**NA**	**Nest#4 is gone**
	Horizontal	**7**	**H1**	**September 9, 2020**	**02:00:38 PM**	**4**	**4**	**0**	**0**	**na**
	Diagonal	7	D1	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Vertical	7	V1	September 9, 2020	02:00:38 PM	2	NA	NA	NA	na
	Horizontal	8	H1	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Diagonal	9	D1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Vertical	9	V1A	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Vertical	9	V1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Diagonal	10	D1A	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Diagonal	10	D1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						55	32	10	4	
TOTAL SUM						99	48	15	4	
TOTAL CHICKS AND ADULTS									19	20 cormorants are roosting at the pier and most of them are juveniles identified from their pale bellies and breasts.
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**September 18, 2020**	**04:17:32 PM**	**7**	**4**	**1**	**1**	**Nest#2 is gone; Nest#5-1**
	Diagonal	2	D1A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Diagonal	**2**	**D1B**	**September 18, 2020**	**04:17:32 PM**	**3**	**2**	**1**	**0**	**na**
	Lower Diagonal	3	LD1A	September 18, 2020	04:17:32 PM	7	NA	1	NA	na
	Lower Diagonal	**3**	**LD1B**	**September 18, 2020**	**04:17:32 PM**	**2**	**NA**	**NA**	**NA**	**na**
	Horizontal	**3**	**H1A**	**September 18, 2020**	**04:17:32 PM**	**5**	**2**	**1**	**1**	**Nest#5-1**
	Horizontal	3	H1B	September 18, 2020	04:17:32 PM	4	2	1	2	Nest#3-2
	Diagonal	3	D1A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Diagonal	3	D1B	September 18, 2020	04:17:32 PM	3	3	0	0	Nest#3 is gone
	Diagonal	**3**	**D2A**	**September 18, 2020**	**04:17:32 PM**	**3**	**3**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**September 18, 2020**	**04:17:32 PM**	**4**	**4**	**0**	**0**	**na**
	Vertical	3	V1A	September 18, 2020	04:17:32 PM	2	NA	NA	NA	na
	Vertical	3	V1B	September 18, 2020	04:17:32 PM	2	NA	NA	NA	na
	Vertical	**3**	**V2A**	**September 18, 2020**	**04:17:32 PM**	**4**	**NA**	**NA**	**NA**	**na**
	Vertical	3	V2B	September 18, 2020	04:17:32 PM	4	NA	NA	NA	na
	Vertical	3	V2C	September 18, 2020	04:17:32 PM	1	0	0	1	Nest#2 is gone
	Vertical	**3**	**V2D**	**September 18, 2020**	**04:17:32 PM**	**3**	**NA**	**NA**	**NA**	**na**
	Horizontal	4	H1A	September 18, 2020	04:17:32 PM	1	1	0	0	Nest#1 is gone
	Horizontal	**4**	**H1B**	**September 18, 2020**	**04:17:32 PM**	**3**	**3**	**0**	**0**	**na**
	Diagonal	4	D1A	September 18, 2020	04:17:32 PM	2	2	0	0	na
	Diagonal	**4**	**D1B**	**September 18, 2020**	**04:17:32 PM**	**1**	**1**	**0**	**0**	**na**
	Diagonal	4	D2A	September 18, 2020	04:17:32 PM	2	1	1	0	na
	Diagonal	4	D2B	September 18, 2020	04:17:32 PM	4	3	0	0	na
	Vertical	4	V1A	September 18, 2020	04:17:32 PM	3	NA	NA	NA	na
	Vertical	4	V1B	September 18, 2020	04:17:32 PM	2	NA	NA	NA	na
	Horizontal	**5**	**H1**	**September 18, 2020**	**04:17:32 PM**	**5**	**4**	**0**	**0**	**na**
	Diagonal	5	D1	September 18, 2020	04:17:32 PM	2	1	1	0	na
	Horizontal	**6**	**H1**	**September 18, 2020**	**04:17:32 PM**	**6**	**6**	**0**	**0**	**Nest#8 is gone**
	Diagonal	**6**	**D1**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**September 18, 2020**	**04:17:32 PM**	**4**	**NA**	**1**	**NA**	**na**
	Horizontal	**7**	**H1**	**September 18, 2020**	**04:17:32 PM**	**4**	**3**	**2**	**1**	**Nest#2-1**
	Diagonal	7	D1	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Vertical	7	V1	September 18, 2020	04:17:32 PM	2	NA	NA	NA	na
	Horizontal	8	H1	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Diagonal	9	D1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Vertical	9	V1A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Vertical	9	V1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Diagonal	10	D1A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Diagonal	10	D1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						54	32	6	3	
TOTAL SUM						95	45	10	6	
TOTAL CHICKS AND ADULTS									16	22 cormorants are roosting at the pier and most of them are juveniles identified from their pale bellies and breasts.
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**September 25, 2020**	**02:17:53 PM**	**7**	**6**	**0**	**0**	**na**
	Diagonal	2	D1A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Diagonal	**2**	**D1B**	**September 25, 2020**	**02:17:53 PM**	**3**	**3**	**0**	**0**	**na**
	Lower Diagonal	3	LD1A	September 25, 2020	02:17:53 PM	6	NA	NA	NA	Nest#7 is gone
	Lower Diagonal	**3**	**LD1B**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**Nest#1 and Nest#2 are gone**
	Horizontal	**3**	**H1A**	**September 25, 2020**	**02:17:53 PM**	**5**	**4**	**0**	**0**	**na**
	Horizontal	3	H1B	September 25, 2020	02:17:53 PM	4	4	0	0	na
	Diagonal	3	D1A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Diagonal	3	D1B	September 25, 2020	02:17:53 PM	2	2	0	0	na
	Diagonal	**3**	**D2A**	**September 25, 2020**	**02:17:53 PM**	**3**	**3**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**September 25, 2020**	**02:17:53 PM**	**4**	**4**	**0**	**0**	**na**
	Vertical	3	V1A	September 25, 2020	02:17:53 PM	2	NA	NA	NA	na
	Vertical	3	V1B	September 25, 2020	02:17:53 PM	2	NA	NA	NA	na
	Vertical	**3**	**V2A**	**September 25, 2020**	**02:17:53 PM**	**4**	**NA**	**NA**	**NA**	**na**
	Vertical	3	V2B	September 25, 2020	02:17:53 PM	4	NA	NA	NA	na
	Vertical	3	V2C	September 25, 2020	02:17:53 PM	1	NA	NA	NA	na
	Vertical	**3**	**V2D**	**September 25, 2020**	**02:17:53 PM**	**3**	**NA**	**NA**	**NA**	**na**
	Horizontal	4	H1A	September 25, 2020	02:17:53 PM	1	1	0	0	na
	Horizontal	**4**	**H1B**	**September 25, 2020**	**02:17:53 PM**	**3**	**3**	**0**	**0**	**na**
	Diagonal	4	D1A	September 25, 2020	02:17:53 PM	2	2	0	0	na
	Diagonal	**4**	**D1B**	**September 25, 2020**	**02:17:53 PM**	**1**	**0**	**0**	**1**	**na**
	Diagonal	4	D2A	September 25, 2020	02:17:53 PM	2	2	0	0	na
	Diagonal	4	D2B	September 25, 2020	02:17:53 PM	4	3	0	0	na
	Vertical	4	V1A	September 25, 2020	02:17:53 PM	3	NA	NA	NA	na
	Vertical	4	V1B	September 25, 2020	02:17:53 PM	2	NA	NA	NA	na
	Horizontal	**5**	**H1**	**September 25, 2020**	**02:17:53 PM**	**4**	**3**	**0**	**0**	**Nest#3 is gone**
	Diagonal	5	D1	September 25, 2020	02:17:53 PM	2	2	0	0	na
	Horizontal	**6**	**H1**	**September 25, 2020**	**02:17:53 PM**	**7**	**6**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**September 25, 2020**	**02:17:53 PM**	**4**	**NA**	**NA**	**NA**	**na**
	Horizontal	**7**	**H1**	**September 25, 2020**	**02:17:53 PM**	**4**	**4**	**0**	**0**	**na**
	Diagonal	7	D1	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Vertical	7	V1	September 25, 2020	02:17:53 PM	2	NA	1	NA	na
	Horizontal	8	H1	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Diagonal	9	D1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Vertical	9	V1A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Vertical	9	V1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Diagonal	10	D1A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Diagonal	10	D1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						52	36	0	1	
TOTAL SUM						91	52	1	1	
TOTAL CHICKS AND ADULTS									2	18 cormorants are roosting at the pier and most of them are juveniles identified from their pale bellies and breasts.
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**October 2, 2020**	**12:44:25 PM**	**7**	**6**	**0**	**0**	**na**
	Diagonal	2	D1A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Diagonal	**2**	**D1B**	**October 2, 2020**	**12:44:25 PM**	**3**	**3**	**0**	**0**	**na**
	Lower Diagonal	3	LD1A	October 2, 2020	12:44:25 PM	4	NA	NA	NA	Nest#3 and Nest#6 are gone
	Lower Diagonal	**3**	**LD1B**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**3**	**H1A**	**October 2, 2020**	**12:44:25 PM**	**5**	**5**	**0**	**0**	**na**
	Horizontal	3	H1B	October 2, 2020	12:44:25 PM	4	4	0	0	na
	Diagonal	3	D1A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Diagonal	3	D1B	October 2, 2020	12:44:25 PM	2	2	0	0	na
	Diagonal	**3**	**D2A**	**October 2, 2020**	**12:44:25 PM**	**3**	**3**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**October 2, 2020**	**12:44:25 PM**	**4**	**4**	**0**	**0**	**na**
	Vertical	3	V1A	October 2, 2020	12:44:25 PM	2	NA	NA	NA	na
	Vertical	3	V1B	October 2, 2020	12:44:25 PM	2	NA	NA	NA	na
	Vertical	**3**	**V2A**	**October 2, 2020**	**12:44:25 PM**	**4**	**NA**	**NA**	**NA**	**na**
	Vertical	3	V2B	October 2, 2020	12:44:25 PM	3	NA	NA	NA	Nest#4 is gone
	Vertical	3	V2C	October 2, 2020	12:44:25 PM	1	NA	NA	NA	na
	Vertical	**3**	**V2D**	**October 2, 2020**	**12:44:25 PM**	**2**	**NA**	**NA**	**NA**	**Nest#1 is gone**
	Horizontal	4	H1A	October 2, 2020	12:44:25 PM	1	1	0	0	na
	Horizontal	**4**	**H1B**	**October 2, 2020**	**12:44:25 PM**	**3**	**3**	**0**	**0**	**na**
	Diagonal	4	D1A	October 2, 2020	12:44:25 PM	2	2	0	0	na
	Diagonal	**4**	**D1B**	**October 2, 2020**	**12:44:25 PM**	**1**	**1**	**0**	**0**	**na**
	Diagonal	4	D2A	October 2, 2020	12:44:25 PM	2	2	0	0	na
	Diagonal	4	D2B	October 2, 2020	12:44:25 PM	4	4	0	0	na
	Vertical	4	V1A	October 2, 2020	12:44:25 PM	3	NA	NA	NA	na
	Vertical	4	V1B	October 2, 2020	12:44:25 PM	2	NA	NA	NA	na
	Horizontal	**5**	**H1**	**October 2, 2020**	**12:44:25 PM**	**4**	**3**	**0**	**0**	**na**
	Diagonal	5	D1	October 2, 2020	12:44:25 PM	2	2	0	0	na
	Horizontal	**6**	**H1**	**October 2, 2020**	**12:44:25 PM**	**6**	**5**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**October 2, 2020**	**12:44:25 PM**	**3**	**NA**	**NA**	**NA**	**Nest#1 debris is hanging loosely on the edge - not c**
	Horizontal	**7**	**H1**	**October 2, 2020**	**12:44:25 PM**	**4**	**4**	**0**	**0**	**na**
	Diagonal	7	D1	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Vertical	7	V1	October 2, 2020	12:44:25 PM	2	NA	NA	NA	na
	Horizontal	8	H1	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Diagonal	9	D1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Vertical	9	V1A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Vertical	9	V1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Diagonal	10	D1A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Diagonal	10	D1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						49	37	0	0	
TOTAL SUM						85	54	0	0	
TOTAL CHICKS AND ADULTS									0	
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**Nests#1,#2, #3, #4, #5, #6, #7 are gone(all gone)**
	Diagonal	2	D1A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Diagonal	**2**	**D1B**	**December 22, 2020**	**04:09:00 PM**	**1**	**1**	**0**	**0**	**Nest#1 and Nest#2 are gone**
	Lower Diagonal	3	LD1A	December 22, 2020	04:09:00 PM	4	NA	NA	NA	na
	Lower Diagonal	**3**	**LD1B**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**3**	**H1A**	**December 22, 2020**	**04:09:00 PM**	**5**	**4**	**0**	**0**	**na**
	Horizontal	3	H1B	December 22, 2020	04:09:00 PM	4	4	0	0	na
	Diagonal	3	D1A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Diagonal	3	D1B	December 22, 2020	04:09:00 PM	1	NA	0	0	na
	Diagonal	**3**	**D2A**	**December 22, 2020**	**04:09:00 PM**	**2**	**2**	**0**	**0**	**Nest#1 is gone**
	Diagonal	**3**	**D2B**	**December 22, 2020**	**04:09:00 PM**	**4**	**4**	**0**	**0**	**na**
	Vertical	3	V1A	December 22, 2020	04:09:00 PM	1	NA	NA	NA	Nest#2 is gone
	Vertical	3	V1B	December 22, 2020	04:09:00 PM	1	NA	NA	NA	Nest#1 is gone
	Vertical	**3**	**V2A**	**December 22, 2020**	**04:09:00 PM**	**4**	**NA**	**NA**	**NA**	**na**
	Vertical	3	V2B	December 22, 2020	04:09:00 PM	3	NA	NA	NA	na
	Vertical	3	V2C	December 22, 2020	04:09:00 PM	1	NA	NA	NA	na
	Vertical	**3**	**V2D**	**December 22, 2020**	**04:09:00 PM**	**2**	**NA**	**NA**	**NA**	**na**
	Horizontal	4	H1A	December 22, 2020	04:09:00 PM	1	1	0	0	na
	Horizontal	**4**	**H1B**	**December 22, 2020**	**04:09:00 PM**	**2**	**2**	**0**	**0**	**Nest#3 is gone**
	Diagonal	4	D1A	December 22, 2020	04:09:00 PM	2	2	0	0	na
	Diagonal	**4**	**D1B**	**December 22, 2020**	**04:09:00 PM**	**1**	**1**	**0**	**0**	**na**
	Diagonal	4	D2A	December 22, 2020	04:09:00 PM	2	2	0	0	na
	Diagonal	4	D2B	December 22, 2020	04:09:00 PM	4	4	0	0	na
	Vertical	4	V1A	December 22, 2020	04:09:00 PM	3	NA	NA	NA	na
	Vertical	4	V1B	December 22, 2020	04:09:00 PM	2	NA	NA	NA	na
	Horizontal	**5**	**H1**	**December 22, 2020**	**04:09:00 PM**	**4**	**3**	**0**	**0**	**na**
	Diagonal	5	D1	December 22, 2020	04:09:00 PM	2	2	0	0	na
	Horizontal	**6**	**H1**	**December 22, 2020**	**04:09:00 PM**	**4**	**4**	**0**	**0**	**Nest#4, #5 are gone**
	Diagonal	**6**	**D1**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**December 22, 2020**	**04:09:00 PM**	**3**	**NA**	**NA**	**NA**	**na**
	Horizontal	**7**	**H1**	**December 22, 2020**	**04:09:00 PM**	**3**	**3**	**0**	**0**	**Nest#2 is gone**
	Diagonal	7	D1	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Vertical	7	V1	December 22, 2020	04:09:00 PM	2	2	0	0	na
	Horizontal	8	H1	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Diagonal	9	D1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Vertical	9	V1A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Vertical	9	V1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Diagonal	10	D1A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Diagonal	10	D1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						35	24	0	0	
TOTAL SUM						68	41	0	0	
TOTAL CHICKS AND ADULTS									0	
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	2	D1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Diagonal	**2**	**D1B**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**Nest#1 gone**
	Lower Diagonal	3	LD1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**3**	**H1A**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**Nest#1, #2, #3, #4, #5 are gone (all Gone)**
	Horizontal	3	H1B	March 5, 2021	05:34:00 PM	3	3	0	0	Nest#3 is gone
	Diagonal	3	D1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Diagonal	3	D1B	March 5, 2021	05:34:00 PM	1	NA	0	0	na
	Diagonal	**3**	**D2A**	**March 5, 2021**	**05:34:00 PM**	**2**	**2**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**March 5, 2021**	**05:34:00 PM**	**4**	**4**	**0**	**0**	**na**
	Vertical	3	V1A	March 5, 2021	05:34:00 PM	1	NA	NA	NA	na
	Vertical	3	V1B	March 5, 2021	05:34:00 PM	0	NA	NA	NA	na
	Vertical	**3**	**V2A**	**March 5, 2021**	**05:34:00 PM**	**4**	**NA**	**NA**	**NA**	**na**
	Vertical	3	V2B	March 5, 2021	05:34:00 PM	3	NA	NA	NA	na
	Vertical	3	V2C	March 5, 2021	05:34:00 PM	1	NA	NA	NA	na
	Vertical	**3**	**V2D**	**March 5, 2021**	**05:34:00 PM**	**1**	**NA**	**NA**	**NA**	**Nest#2 is gone**
	Horizontal	4	H1A	March 5, 2021	05:34:00 PM	1	1	0	0	na
	Horizontal	**4**	**H1B**	**March 5, 2021**	**05:34:00 PM**	**2**	**2**	**0**	**0**	**na**
	Diagonal	4	D1A	March 5, 2021	05:34:00 PM	1	1	0	0	Nest#2 is gone
	Diagonal	**4**	**D1B**	**March 5, 2021**	**05:34:00 PM**	**1**	**1**	**0**	**0**	**na**
	Diagonal	4	D2A	March 5, 2021	05:34:00 PM	1	1	0	0	Nest#2 is gone
	Diagonal	4	D2B	March 5, 2021	05:34:00 PM	4	4	0	0	na
	Vertical	4	V1A	March 5, 2021	05:34:00 PM	3	NA	NA	NA	na
	Vertical	4	V1B	March 5, 2021	05:34:00 PM	2	NA	NA	NA	na
	Horizontal	**5**	**H1**	**March 5, 2021**	**05:34:00 PM**	**4**	**3**	**0**	**0**	**na**
	Diagonal	5	D1	March 5, 2021	05:34:00 PM	2	2	0	0	na
	Horizontal	**6**	**H1**	**March 5, 2021**	**05:34:00 PM**	**3**	**3**	**0**	**0**	**Nest#3 gone**
	Diagonal	**6**	**D1**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**March 5, 2021**	**05:34:00 PM**	**3**	**NA**	**NA**	**NA**	**na**
	Horizontal	**7**	**H1**	**March 5, 2021**	**05:34:00 PM**	**3**	**3**	**0**	**0**	**na**
	Diagonal	7	D1	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Vertical	7	V1	March 5, 2021	05:34:00 PM	2	2	0	0	na
	Horizontal	8	H1	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Diagonal	9	D1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Vertical	9	V1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Vertical	9	V1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Diagonal	10	D1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Diagonal	10	D1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						27	18	0	0	
TOTAL SUM						52	32	0	0	
TOTAL CHICKS AND ADULTS									0	
	NA - Possible nests and chicks could not be identified									

Appendix J.

Metadata for Pelagic Cormorant at the Ironworkers Memorial Bridge.

Random Selects	Beam Position	Beam Section	Beam Code	ImageDate	ImageTime	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 3, 2020	05:48:40 PM	1	0	2	0	na
	Lower Diagonal	2	LD1A	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 3, 2020**	**05:48:40 PM**	**1**	**0**	**2**	**0**	**na**
	Diagonal	2	D1A	June 3, 2020	05:48:40 PM	1	0	1	0	na
	Diagonal	**2**	**D1B**	**June 3, 2020**	**05:48:40 PM**	**1**	**0**	**0**	**0**	**na**
	Lower Diagonal	3	LD1A	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**June 3, 2020**	**05:48:40 PM**	**1**	**0**	**1**	**0**	**na**
	Horizontal	**3**	**H1A**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Diagonal	3	D1A	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Diagonal	3	D1B	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Vertical	3	V1B	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Vertical	3	V2C	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Diagonal	4	D2B	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Vertical	4	V1A	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Vertical	4	V1B	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Vertical	7	V1	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Horizontal	8	H1	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Diagonal	9	D1B	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Vertical	9	V1A	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Vertical	9	V1B	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Diagonal	10	D1A	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Diagonal	10	D1B	June 3, 2020	05:48:40 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 3, 2020**	**05:48:40 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	June 3, 2020	05:48:40 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						3	0	3	0	
TOTAL SUM						5	0	6	0	

Random Selects	Beam Position	Beam Section	Beam Code	ImageDate	ImageTime	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 5, 2020	06:28:26 PM	1	0	2	0	na
	Lower Diagonal	2	LD1A	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 5, 2020**	**06:28:26 PM**	**1**	**0**	**1**	**0**	**na**
	Diagonal	2	D1A	June 5, 2020	06:28:26 PM	1	0	1	0	na
	Diagonal	**2**	**D1B**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Lower Diagonal	3	LD1A	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**June 5, 2020**	**06:28:26 PM**	**1**	**0**	**1**	**0**	**na**
	Horizontal	**3**	**H1A**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Diagonal	3	D1A	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Diagonal	3	D1B	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Vertical	3	V1B	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Vertical	3	V2C	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Diagonal	4	D2B	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Vertical	4	V1A	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Vertical	4	V1B	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Vertical	7	V1	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Horizontal	8	H1	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Diagonal	9	D1B	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Vertical	9	V1A	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Vertical	9	V1B	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Diagonal	10	D1A	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Diagonal	10	D1B	June 5, 2020	06:28:26 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 5, 2020**	**06:28:26 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	June 5, 2020	06:28:26 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						2	0	2	0	
TOTAL SUM						4	0	5	0	

Random Selects	Beam Position	Beam Section	Beam Code	ImageDate	ImageTime	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 8, 2020	06:10:43 PM	1	0	1	NA	na
	Lower Diagonal	2	LD1A	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 8, 2020**	**06:10:43 PM**	**1**	**0**	**2**	**NA**	**na**
	Diagonal	2	D1A	June 8, 2020	06:10:43 PM	1	0	1	NA	na
	Diagonal	**2**	**D1B**	**June 8, 2020**	**06:10:43 PM**	**1**	**NA**	**0**	**NA**	**na**
	Lower Diagonal	3	LD1A	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**June 8, 2020**	**06:10:43 PM**	**1**	**0**	**2**	**NA**	**na**
	Horizontal	**3**	**H1A**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Diagonal	3	D1A	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Diagonal	3	D1B	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Vertical	3	V1B	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Vertical	3	V2C	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Diagonal	4	D2B	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Vertical	4	V1A	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Vertical	4	V1B	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Vertical	7	V1	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Horizontal	8	H1	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Diagonal	9	D1B	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Vertical	9	V1A	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Vertical	9	V1B	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Diagonal	10	D1A	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Diagonal	10	D1B	June 8, 2020	06:10:43 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 8, 2020**	**06:10:43 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	June 8, 2020	06:10:43 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						3	0	4	0	
TOTAL SUM						5	0	6	0	

Random Selects	Beam Position	Beam Section	Beam Code	ImageDate	ImageTime	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 10, 2020	06:32:25 PM	1	0	1	NA	na
	Lower Diagonal	2	LD1A	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 10, 2020**	**06:32:25 PM**	**1**	**0**	**2**	**NA**	**na**
	Diagonal	2	D1A	June 10, 2020	06:32:25 PM	1	0	1	NA	na
	Diagonal	**2**	**D1B**	**June 10, 2020**	**06:32:25 PM**	**1**	**NA**	**0**	**NA**	**na**
	Lower Diagonal	3	LD1A	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**June 10, 2020**	**06:32:25 PM**	**1**	**0**	**2**	**NA**	**na**
	Horizontal	**3**	**H1A**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Diagonal	3	D1A	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Diagonal	3	D1B	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Vertical	3	V1B	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Vertical	3	V2C	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Diagonal	4	D2B	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Vertical	4	V1A	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Vertical	4	V1B	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Vertical	7	V1	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Horizontal	8	H1	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Diagonal	9	D1B	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Vertical	9	V1A	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Vertical	9	V1B	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Diagonal	10	D1A	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Diagonal	10	D1B	June 10, 2020	06:32:25 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 10, 2020**	**06:32:25 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	June 10, 2020	06:32:25 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						3	0	4	0	
TOTAL SUM						5	0	6	0	

Random Selects	Beam Position	Beam Section	Beam Code	ImageDate	ImageTime	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 17, 2020	06:05:07 PM	1	0	1	NA	na
	Lower Diagonal	2	LD1A	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 17, 2020**	**06:05:07 PM**	**1**	**0**	**1**	**NA**	**na**
	Diagonal	2	D1A	June 17, 2020	06:05:07 PM	1	NA	0	NA	na
	Diagonal	**2**	**D1B**	**June 17, 2020**	**06:05:07 PM**	**1**	**NA**	**0**	**NA**	**na**
	Lower Diagonal	3	LD1A	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**June 17, 2020**	**06:05:07 PM**	**1**	**0**	**1**	**NA**	**na**
	Horizontal	**3**	**H1A**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Diagonal	3	D1A	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Diagonal	3	D1B	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Vertical	3	V1B	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Vertical	3	V2C	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Diagonal	4	D2B	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Vertical	4	V1A	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Vertical	4	V1B	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Vertical	7	V1	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Horizontal	8	H1	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Diagonal	9	D1B	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Vertical	9	V1A	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Vertical	9	V1B	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Diagonal	10	D1A	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Diagonal	10	D1B	June 17, 2020	06:05:07 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 17, 2020**	**06:05:07 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	June 17, 2020	06:05:07 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						3	0	2	0	
TOTAL SUM						5	0	3	0	

Random Selects	Beam Position	Beam Section	Beam Code	ImageDate	ImageTime	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 19, 2020	06:24:13 PM	1	NA	0	NA	The bird is gone!?
	Lower Diagonal	2	LD1A	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 19, 2020**	**06:24:13 PM**	**1**	**0**	**1**	**NA**	**na**
	Diagonal	2	D1A	June 19, 2020	06:24:13 PM	1	0	1	NA	na
	Diagonal	**2**	**D1B**	**June 19, 2020**	**06:24:13 PM**	**1**	**NA**	**0**	**NA**	**na**
	Lower Diagonal	3	LD1A	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**June 19, 2020**	**06:24:13 PM**	**1**	**0**	**0**	**NA**	**na**
	Horizontal	**3**	**H1A**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Diagonal	3	D1A	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Diagonal	3	D1B	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Vertical	3	V1B	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Vertical	3	V2C	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Diagonal	4	D2B	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Vertical	4	V1A	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Vertical	4	V1B	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Vertical	7	V1	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Horizontal	8	H1	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Diagonal	9	D1B	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Vertical	9	V1A	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Vertical	9	V1B	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Diagonal	10	D1A	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Diagonal	10	D1B	June 19, 2020	06:24:13 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 19, 2020**	**06:24:13 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	June 19, 2020	06:24:13 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						3	0	1	0	
TOTAL SUM						5	0	2	0	

Random Selects	Beam Position	Beam Section	Beam Code	ImageDate	ImageTime	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 22, 2020	06:01:31 PM	1	0	1	NA	na
	Lower Diagonal	2	LD1A	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 22, 2020**	**06:01:31 PM**	**1**	**0**	**1**	**NA**	**na**
	Diagonal	2	D1A	June 22, 2020	06:01:31 PM	1	0	1	NA	na
	Diagonal	**2**	**D1B**	**June 22, 2020**	**06:01:31 PM**	**2**	**NA**	**1**	**NA**	**New nest appears in the other corner**
	Lower Diagonal	3	LD1A	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**June 22, 2020**	**06:01:31 PM**	**1**	**0**	**1**	**NA**	**na**
	Horizontal	**3**	**H1A**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Diagonal	3	D1A	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Diagonal	3	D1B	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Vertical	3	V1B	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Vertical	3	V2C	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Diagonal	4	D2B	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Vertical	4	V1A	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Vertical	4	V1B	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Vertical	7	V1	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Horizontal	8	H1	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Diagonal	9	D1B	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Vertical	9	V1A	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Vertical	9	V1B	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Diagonal	10	D1A	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Diagonal	10	D1B	June 22, 2020	06:01:31 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 22, 2020**	**06:01:31 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	June 22, 2020	06:01:31 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						4	0	3	0	
TOTAL SUM						6	0	5	0	

Random Selects	Beam Position	Beam Section	Beam Code	ImageDate	ImageTime	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 24, 2020	06:15:50 PM	1	0	2	NA	na
	Lower Diagonal	2	LD1A	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 24, 2020**	**06:15:50 PM**	**1**	**0**	**1**	**NA**	**na**
	Diagonal	2	D1A	June 24, 2020	06:15:50 PM	1	0	1	NA	na
	Diagonal	**2**	**D1B**	**June 24, 2020**	**06:15:50 PM**	**2**	**0**	**1**	**NA**	**na**
	Lower Diagonal	3	LD1A	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**June 24, 2020**	**06:15:50 PM**	**1**	**0**	**1**	**NA**	**na**
	Horizontal	**3**	**H1A**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Diagonal	3	D1A	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Diagonal	3	D1B	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Vertical	3	V1B	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Vertical	3	V2C	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Diagonal	4	D2B	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Vertical	4	V1A	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Vertical	4	V1B	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Vertical	7	V1	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Horizontal	8	H1	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Diagonal	9	D1B	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Vertical	9	V1A	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Vertical	9	V1B	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Diagonal	10	D1A	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Diagonal	10	D1B	June 24, 2020	06:15:50 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 24, 2020**	**06:15:50 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	June 24, 2020	06:15:50 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						4	0	3	0	
TOTAL SUM						6	0	6	0	

Random Selects	Beam Position	Beam Section	Beam Code	ImageDate	ImageTime	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 26, 2020	06:14:03 PM	1	0	1	NA	na
	Lower Diagonal	2	LD1A	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 26, 2020**	**06:14:03 PM**	**1**	**0**	**1**	**NA**	**na**
	Diagonal	2	D1A	June 26, 2020	06:14:03 PM	1	0	NA	NA	na
	Diagonal	**2**	**D1B**	**June 26, 2020**	**06:14:03 PM**	**1**	**0**	**NA**	**NA**	**na**
	Lower Diagonal	3	LD1A	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**June 26, 2020**	**06:14:03 PM**	**1**	**0**	**1**	**NA**	**na**
	Horizontal	**3**	**H1A**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Diagonal	3	D1A	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Diagonal	3	D1B	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Vertical	3	V1B	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Vertical	3	V2C	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Diagonal	4	D2B	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Vertical	4	V1A	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Vertical	4	V1B	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Vertical	7	V1	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Horizontal	8	H1	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Diagonal	9	D1B	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Vertical	9	V1A	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Vertical	9	V1B	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Diagonal	10	D1A	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Diagonal	10	D1B	June 26, 2020	06:14:03 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 26, 2020**	**06:14:03 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	June 26, 2020	06:14:03 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						3	0	2	0	
TOTAL SUM						5	0	3	0	

Random Selects	Beam Position	Beam Section	Beam Code	ImageDate	ImageTime	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	June 29, 2020	05:57:43 PM	1	0	1	NA	na
	Lower Diagonal	2	LD1A	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**June 29, 2020**	**05:57:43 PM**	**1**	**0**	**1**	**NA**	**na**
	Diagonal	2	D1A	June 29, 2020	05:57:43 PM	1	0	1	NA	na
	Diagonal	**2**	**D1B**	**June 29, 2020**	**05:57:43 PM**	**1**	**0**	**NA**	**NA**	**na**
	Lower Diagonal	3	LD1A	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**June 29, 2020**	**05:57:43 PM**	**1**	**0**	**NA**	**NA**	**na**
	Horizontal	**3**	**H1A**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Diagonal	3	D1A	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Diagonal	3	D1B	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Vertical	3	V1B	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Vertical	3	V2C	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Diagonal	4	D2B	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Vertical	4	V1A	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Vertical	4	V1B	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Vertical	7	V1	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Horizontal	8	H1	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Diagonal	9	D1B	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Vertical	9	V1A	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Vertical	9	V1B	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Diagonal	10	D1A	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Diagonal	10	D1B	June 29, 2020	05:57:43 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**June 29, 2020**	**05:57:43 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	June 29, 2020	05:57:43 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						3	0	1	0	
TOTAL SUM						5	0	3	0	

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	July 3, 2020	02:41:38 PM	1	0	1	0	The nest turns dark
	Lower Diagonal	2	LD1A	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**July 3, 2020**	**02:41:38 PM**	**1**	**0**	**1**	**NA**	**The nest turns dark**
	Diagonal	2	D1A	July 3, 2020	02:41:38 PM	1	0	1	NA	The nest turns dark
	Diagonal	**2**	**D1B**	**July 3, 2020**	**02:41:38 PM**	**2**	**NA**	**1**	**NA**	**The nest turn dark**
	Lower Diagonal	3	LD1A	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**July 3, 2020**	**02:41:38 PM**	**1**	**0**	**1**	**0**	**The nest turns dark**
	Horizontal	**3**	**H1A**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Diagonal	3	D1A	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Diagonal	3	D1B	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Vertical	3	V1B	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Vertical	3	V2C	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Diagonal	4	D2B	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Vertical	4	V1A	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Vertical	4	V1B	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Vertical	7	V1	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Horizontal	8	H1	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Diagonal	9	D1B	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Vertical	9	V1A	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Vertical	9	V1B	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Diagonal	10	D1A	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Diagonal	10	D1B	July 3, 2020	02:41:38 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**July 3, 2020**	**02:41:38 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	July 3, 2020	02:41:38 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						4	0	3	0	
TOTAL SUM						6	0	5	0	

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	July 8, 2020	04:41:04 PM	1	0	1	0	One cormorant is dead (wing and possibly head obse
	Lower Diagonal	2	LD1A	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**July 8, 2020**	**04:41:04 PM**	**1**	**0**	**2**	**NA**	**na**
	Diagonal	2	D1A	July 8, 2020	04:41:04 PM	1	0	1	NA	na
	Diagonal	**2**	**D1B**	**July 8, 2020**	**04:41:04 PM**	**2**	**NA**	**NA**	**NA**	**na**
	Lower Diagonal	3	LD1A	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**July 8, 2020**	**04:41:04 PM**	**1**	**0**	**1**	**NA**	**na**
	Horizontal	**3**	**H1A**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Diagonal	3	D1A	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Diagonal	3	D1B	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Vertical	3	V1B	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Vertical	3	V2C	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	July 8, 2020	04:41:04 PM	0	0	0	0	There might be one Pelagic Cormorant nest at the be
	Diagonal	**4**	**D1B**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Diagonal	4	D2B	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Vertical	4	V1A	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Vertical	4	V1B	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Vertical	7	V1	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Horizontal	8	H1	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Diagonal	9	D1B	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Vertical	9	V1A	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Vertical	9	V1B	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Diagonal	10	D1A	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Diagonal	10	D1B	July 8, 2020	04:41:04 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**July 8, 2020**	**04:41:04 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	July 8, 2020	04:41:04 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						4	0	3	0	
TOTAL SUM						6	0	5	0	

Random Selects	Beam Position	Beam Section	Beam Code	ImageDate	ImageTime	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	July 15, 2020	03:52:00 PM	1	0	1	0	One Pelagic Cormorant is dead (wing and possibly he
	Lower Diagonal	2	LD1A	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**July 15, 2020**	**03:52:00 PM**	**1**	**0**	**1**	**NA**	**na**
	Diagonal	2	D1A	July 15, 2020	03:52:00 PM	1	0	1	NA	na
	Diagonal	**2**	**D1B**	**July 15, 2020**	**03:52:00 PM**	**2**	**0**	**2**	**NA**	**na**
	Lower Diagonal	3	LD1A	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**July 15, 2020**	**03:52:00 PM**	**1**	**0**	**1**	**0**	**na**
	Horizontal	**3**	**H1A**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Diagonal	3	D1A	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Diagonal	3	D1B	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Vertical	3	V1B	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Vertical	3	V2C	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	July 15, 2020	03:52:00 PM	0	0	0	0	Dark corner in the photo does not justify for a nest
	Diagonal	**4**	**D1B**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Diagonal	4	D2B	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Vertical	4	V1A	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Vertical	4	V1B	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Vertical	7	V1	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Horizontal	8	H1	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Diagonal	9	D1B	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Vertical	9	V1A	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Vertical	9	V1B	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Diagonal	10	D1A	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Diagonal	10	D1B	July 15, 2020	03:52:00 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**July 15, 2020**	**03:52:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	July 15, 2020	03:52:00 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						4	0	4	0	
TOTAL SUM						6	0	6	0	

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	July 22, 2020	03:16:03 PM	1	0	1	0	na
	Lower Diagonal	2	LD1A	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**July 22, 2020**	**03:16:03 PM**	**1**	**0**	**1**	**NA**	**na**
	Diagonal	2	D1A	July 22, 2020	03:16:03 PM	1	0	1	NA	na
	Diagonal	**2**	**D1B**	**July 22, 2020**	**03:16:03 PM**	**2**	**NA**	**1**	**NA**	**na**
	Lower Diagonal	3	LD1A	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**July 22, 2020**	**03:16:03 PM**	**1**	**0**	**1**	**0**	**na**
	Horizontal	**3**	**H1A**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Diagonal	3	D1A	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Diagonal	3	D1B	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Vertical	3	V1B	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Vertical	3	V2C	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Diagonal	4	D2B	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Vertical	4	V1A	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Vertical	4	V1B	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Vertical	7	V1	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Horizontal	8	H1	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Diagonal	9	D1B	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Vertical	9	V1A	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Vertical	9	V1B	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Diagonal	10	D1A	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Diagonal	10	D1B	July 22, 2020	03:16:03 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**July 22, 2020**	**03:16:03 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	July 22, 2020	03:16:03 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						4	0	3	0	
TOTAL SUM						6	0	5	0	

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	July 29, 2020	02:22:06 PM	1	0	1	NA	na
	Lower Diagonal	2	LD1A	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**July 29, 2020**	**02:22:06 PM**	**2**	**NA**	**1**	**NA**	**na**
	Diagonal	2	D1A	July 29, 2020	02:22:06 PM	1	NA	NA	NA	na
	Diagonal	**2**	**D1B**	**July 29, 2020**	**02:22:06 PM**	**2**	**NA**	**1**	**NA**	**na**
	Lower Diagonal	3	LD1A	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**July 29, 2020**	**02:22:06 PM**	**1**	**0**	**1**	**0**	**na**
	Horizontal	**3**	**H1A**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Diagonal	3	D1A	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Diagonal	3	D1B	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Vertical	3	V1B	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Vertical	3	V2C	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Diagonal	4	D2B	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Vertical	4	V1A	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Vertical	4	V1B	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Vertical	7	V1	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Horizontal	8	H1	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Diagonal	9	D1B	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Vertical	9	V1A	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Vertical	9	V1B	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Diagonal	10	D1A	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Diagonal	10	D1B	July 29, 2020	02:22:06 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**July 29, 2020**	**02:22:06 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	July 29, 2020	02:22:06 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						5	0	3	0	
TOTAL SUM						7	0	4	0	

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	August 3, 2020	03:16:31 PM	1	0	1	0	na
	Lower Diagonal	2	LD1A	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**August 3, 2020**	**03:16:31 PM**	**2**	**NA**	**1**	**NA**	**na**
	Diagonal	2	D1A	August 3, 2020	03:16:31 PM	1	0	1	NA	na
	Diagonal	**2**	**D1B**	**August 3, 2020**	**03:16:31 PM**	**2**	**NA**	**3**	**NA**	**na**
	Lower Diagonal	3	LD1A	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**August 3, 2020**	**03:16:31 PM**	**1**	**0**	**1**	**0**	**na**
	Horizontal	**3**	**H1A**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Diagonal	3	D1A	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Diagonal	3	D1B	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Vertical	3	V1B	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Vertical	3	V2C	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Diagonal	4	D2B	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Vertical	4	V1A	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Vertical	4	V1B	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Vertical	7	V1	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Horizontal	8	H1	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Diagonal	9	D1B	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Vertical	9	V1A	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Vertical	9	V1B	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Diagonal	10	D1A	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Diagonal	10	D1B	August 3, 2020	03:16:31 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**August 3, 2020**	**03:16:31 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	August 3, 2020	03:16:31 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						5	0	5	0	
TOTAL SUM						7	0	7	0	

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	August 10, 2020	04:16:19 PM	1	1	0	0	na
	Lower Diagonal	2	LD1A	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**August 10, 2020**	**04:16:19 PM**	**2**	**NA**	**1**	**NA**	**na**
	Diagonal	2	D1A	August 10, 2020	04:16:19 PM	1	0	1	NA	na
	Diagonal	**2**	**D1B**	**August 10, 2020**	**04:16:19 PM**	**2**	**NA**	**1**	**NA**	**na**
	Lower Diagonal	3	LD1A	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**August 10, 2020**	**04:16:19 PM**	**1**	**0**	**1**	**NA**	**na**
	Horizontal	**3**	**H1A**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Diagonal	3	D1A	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Diagonal	3	D1B	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Vertical	3	V1B	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Vertical	3	V2C	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Diagonal	4	D2B	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Vertical	4	V1A	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Vertical	4	V1B	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Vertical	7	V1	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Horizontal	8	H1	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Diagonal	9	D1B	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Vertical	9	V1A	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Vertical	9	V1B	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Diagonal	10	D1A	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Diagonal	10	D1B	August 10, 2020	04:16:19 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**August 10, 2020**	**04:16:19 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	August 10, 2020	04:16:19 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						5	0	3	0	
TOTAL SUM						7	1	4	0	
TOTAL CHICKS AND ADULTS									4	
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	August 17, 2020	04:09:38 PM	1	0	1	0	na
	Lower Diagonal	2	LD1A	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**August 17, 2020**	**04:09:38 PM**	**2**	**NA**	**NA**	**NA**	**na**
	Diagonal	2	D1A	August 17, 2020	04:09:38 PM	1	NA	NA	NA	na
	Diagonal	**2**	**D1B**	**August 17, 2020**	**04:09:38 PM**	**2**	**NA**	**1**	**NA**	**na**
	Lower Diagonal	3	LD1A	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**August 17, 2020**	**04:09:38 PM**	**1**	**0**	**1**	**NA**	**na**
	Horizontal	**3**	**H1A**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Diagonal	3	D1A	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Diagonal	3	D1B	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Vertical	3	V1B	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Vertical	3	V2C	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Diagonal	4	D2B	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Vertical	4	V1A	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Vertical	4	V1B	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Vertical	7	V1	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Horizontal	8	H1	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Diagonal	9	D1B	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Vertical	9	V1A	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Vertical	9	V1B	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Diagonal	10	D1A	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Diagonal	10	D1B	August 17, 2020	04:09:38 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**August 17, 2020**	**04:09:38 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	August 17, 2020	04:09:38 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						5	0	2	0	
TOTAL SUM						7	0	3	0	
TOTAL CHICKS AND ADULTS									3	
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	August 24, 2020	01:47:42 PM	0	0	0	0	Nest is gone
	Lower Diagonal	2	LD1A	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**Nest is gone**
	Diagonal	2	D1A	August 24, 2020	01:47:42 PM	0	0	0	0	Nest is gone
	Diagonal	**2**	**D1B**	**August 24, 2020**	**01:47:42 PM**	**2**	**0**	**NA**	**NA**	**na**
	Lower Diagonal	3	LD1A	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**August 24, 2020**	**01:47:42 PM**	**1**	**0**	**1**	**0**	**na**
	Horizontal	**3**	**H1A**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Diagonal	3	D1A	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Diagonal	3	D1B	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Vertical	3	V1B	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Vertical	3	V2C	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Diagonal	4	D2B	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Vertical	4	V1A	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Vertical	4	V1B	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Vertical	7	V1	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Horizontal	8	H1	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Diagonal	9	D1B	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Vertical	9	V1A	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Vertical	9	V1B	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Diagonal	10	D1A	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Diagonal	10	D1B	August 24, 2020	01:47:42 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**August 24, 2020**	**01:47:42 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	August 24, 2020	01:47:42 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						3	0	1	0	
TOTAL SUM						3	0	1	0	
TOTAL CHICKS AND ADULTS									1	
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	2	D1A	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Diagonal	**2**	**D1B**	**August 28, 2020**	**03:16:46 PM**	**2**	**NA**	**NA**	**NA**	**na**
	Lower Diagonal	3	LD1A	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**August 28, 2020**	**03:16:46 PM**	**1**	**0**	**1**	**0**	**Compared to June, this might be a second nesting PE**
	Horizontal	**3**	**H1A**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Diagonal	3	D1A	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Diagonal	3	D1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Vertical	3	V1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Vertical	3	V2C	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Diagonal	4	D2B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Vertical	4	V1A	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Vertical	4	V1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Vertical	7	V1	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Horizontal	8	H1	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Diagonal	9	D1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Vertical	9	V1A	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Vertical	9	V1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Diagonal	10	D1A	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Diagonal	10	D1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**August 28, 2020**	**03:16:46 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	August 28, 2020	03:16:46 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						3	0	1	0	
TOTAL SUM						3	0	1	0	
TOTAL CHICKS AND ADULTS									1	
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	2	D1A	September 2, 2020	12:43:11 PM	1	0	1	0	na
	Diagonal	**2**	**D1B**	**September 2, 2020**	**12:43:11 PM**	**1**	**NA**	**NA**	**NA**	**Nest#2 is gone**
	Lower Diagonal	3	LD1A	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**September 2, 2020**	**12:43:11 PM**	**1**	**0**	**3**	**NA**	**na**
	Horizontal	**3**	**H1A**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Diagonal	3	D1A	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Diagonal	3	D1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Vertical	3	V1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Vertical	3	V2C	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Diagonal	4	D2B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Vertical	4	V1A	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Vertical	4	V1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Vertical	7	V1	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Horizontal	8	H1	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Diagonal	9	D1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Vertical	9	V1A	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Vertical	9	V1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Diagonal	10	D1A	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Diagonal	10	D1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**September 2, 2020**	**12:43:11 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	September 2, 2020	12:43:11 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						2	0	3	0	
TOTAL SUM						3	0	4	0	
TOTAL CHICKS AND ADULTS									4	
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	2	D1A	September 9, 2020	02:00:38 PM	0	0	0	0	Nest#1 is gone
	Diagonal	**2**	**D1B**	**September 9, 2020**	**02:00:38 PM**	**1**	**NA**	**NA**	**NA**	**na**
	Lower Diagonal	3	LD1A	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**September 9, 2020**	**02:00:38 PM**	**1**	**0**	**2**	**NA**	**na**
	Horizontal	**3**	**H1A**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Diagonal	3	D1A	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Diagonal	3	D1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Vertical	3	V1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Vertical	3	V2C	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Diagonal	4	D2B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Vertical	4	V1A	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Vertical	4	V1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Vertical	7	V1	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Horizontal	8	H1	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Diagonal	9	D1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Vertical	9	V1A	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Vertical	9	V1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Diagonal	10	D1A	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Diagonal	10	D1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**September 9, 2020**	**02:00:38 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	September 9, 2020	02:00:38 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						2	0	2	0	
TOTAL SUM						2	0	2	0	
TOTAL CHICKS AND ADULTS									2	
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	2	D1A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Diagonal	**2**	**D1B**	**September 18, 2020**	**04:17:32 PM**	**1**	**0**	**1**	**NA**	**na**
	Lower Diagonal	3	LD1A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**September 18, 2020**	**04:17:32 PM**	**1**	**0**	**1**	**NA**	**There might be one more PECO**
	Horizontal	**3**	**H1A**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Diagonal	3	D1A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Diagonal	3	D1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Vertical	3	V1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Vertical	3	V2C	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Diagonal	4	D2B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Vertical	4	V1A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Vertical	4	V1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Vertical	7	V1	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Horizontal	8	H1	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Diagonal	9	D1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Vertical	9	V1A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Vertical	9	V1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Diagonal	10	D1A	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Diagonal	10	D1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**September 18, 2020**	**04:17:32 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	September 18, 2020	04:17:32 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						2	0	2	0	
TOTAL SUM						2	0	2	0	
TOTAL CHICKS AND ADULTS									2	
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	September 25, 2020	02:17:53 PM	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	2	D1A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Diagonal	**2**	**D1B**	**September 25, 2020**	**02:17:53 PM**	**1**	**NA**	**NA**	**NA**	**na**
	Lower Diagonal	3	LD1A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**September 25, 2020**	**02:17:53 PM**	**1**	**0**	**2**	**NA**	**na**
	Horizontal	**3**	**H1A**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Diagonal	3	D1A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Diagonal	3	D1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Vertical	3	V1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Vertical	3	V2C	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Diagonal	4	D2B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Vertical	4	V1A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Vertical	4	V1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Vertical	7	V1	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Horizontal	8	H1	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Diagonal	9	D1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Vertical	9	V1A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Vertical	9	V1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Diagonal	10	D1A	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Diagonal	10	D1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**September 25, 2020**	**02:17:53 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	September 25, 2020	02:17:53 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						2	0	2	0	
TOTAL SUM						2	0	2	0	
TOTAL CHICKS AND ADULTS									2	
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	2	D1A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Diagonal	**2**	**D1B**	**October 2, 2020**	**12:44:25 PM**	**1**	**NA**	**NA**	**NA**	**na**
	Lower Diagonal	3	LD1A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**October 2, 2020**	**12:44:25 PM**	**1**	**0**	**1**	**NA**	**There might be one more bird inside the girder**
	Horizontal	**3**	**H1A**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Diagonal	3	D1A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Diagonal	3	D1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Vertical	3	V1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Vertical	3	V2C	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Diagonal	4	D2B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Vertical	4	V1A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Vertical	4	V1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Vertical	7	V1	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Horizontal	8	H1	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Diagonal	9	D1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Vertical	9	V1A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Vertical	9	V1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Diagonal	10	D1A	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Diagonal	10	D1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**October 2, 2020**	**12:44:25 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	October 2, 2020	12:44:25 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						2	0	1	0	
TOTAL SUM						2	0	1	0	
TOTAL CHICKS AND ADULTS									1	
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	2	H1	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Diagonal	2	D1A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Diagonal	**2**	**D1B**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Lower Diagonal	3	LD1A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**3**	**H1A**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Diagonal	3	D1A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Diagonal	3	D1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Vertical	3	V1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Vertical	3	V2C	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Diagonal	4	D2B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Vertical	4	V1A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Vertical	4	V1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Vertical	7	V1	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Horizontal	8	H1	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Diagonal	9	D1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Vertical	9	V1A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Vertical	9	V1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Diagonal	10	D1A	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Diagonal	10	D1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**December 22, 2020**	**04:09:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	December 22, 2020	04:09:00 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						0	0	0	0	
TOTAL SUM						0	0	0	0	
TOTAL CHICKS AND ADULTS									0	35 Pelagic Cormorants are roosting at the pier
	NA - Possible nests and chicks could not be identified									

Random Selects	Beam Position	Beam Section	Beam Code	Image Date	Image Time	Nests	Empty Nests	No. Birds	Chicks Visible	Notes and Remarks
	Diagonal	**1**	**D1A**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	1	D1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Lower Diagonal	2	LD1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Lower Diagonal	**2**	**LD1B**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**2**	**H1**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	2	D1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Diagonal	**2**	**D1B**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Lower Diagonal	3	LD1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Lower Diagonal	**3**	**LD1B**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**3**	**H1A**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	3	H1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Diagonal	3	D1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Diagonal	3	D1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Diagonal	**3**	**D2A**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**3**	**D2B**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Vertical	3	V1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Vertical	**3**	**V2A**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	3	V2B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Vertical	3	V2C	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Vertical	**3**	**V2D**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	4	H1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Horizontal	**4**	**H1B**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Diagonal	**4**	**D1B**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	4	D2A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Diagonal	4	D2B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Vertical	4	V1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Vertical	4	V1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Horizontal	**5**	**H1**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	5	D1	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Horizontal	**6**	**H1**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	**6**	**D1**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	**6**	**V1**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**7**	**H1**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	7	D1	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Vertical	7	V1	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Horizontal	8	H1	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Diagonal	**8**	**D1A**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	8	D1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Vertical	**8**	**V1**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1A**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	**9**	**H1B**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Diagonal	9	D1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Diagonal	9	D1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Vertical	9	V1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Vertical	9	V1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Horizontal	**10**	**H1A**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Horizontal	10	H1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Diagonal	10	D1A	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Diagonal	10	D1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
	Vertical	**10**	**V1A**	**March 5, 2021**	**05:34:00 PM**	**0**	**0**	**0**	**0**	**na**
	Vertical	10	V1B	March 5, 2021	05:34:00 PM	0	0	0	0	na
TOTAL RANDOMLY SELECTED						0	0	0	0	
TOTAL SUM						0	0	0	0	
TOTAL CHICKS AND ADULTS									0	31 Pelagic Cormorants are roosting at the pier
	NA - Possible nests and chicks could not be identified									

Appendix K.

Metadata of Sampling at All Research Sites.

Date	Day	Location	Start time	End time	Duration	No. of images	GigaPan data file name (.gigapan)	PTGui Pro file name (.pts)	Exported image file name	Type	File size (GB)	Notes and remarks
19-04-2020	Sunday	IMMB	05:19:00 PM	06:00:00 PM	30m	3				.arw	0.18	Site visit
30-04-2020	Thursday	IMMB	05:17:00 PM	07:23:00 PM	1hr 54m	5				.jpeg	0.1787	Site visit
06-05-2020	Wednesday	IMMB; Spans 0-2	11:59:31 AM	12:26:04 PM	26m 33s	630	Pano1		SNB_06052020_121576x21552	.raw	7.86	Not processed
06-05-2020	Wednesday	IMMB	12:56:00 PM	01:26:00 PM	30m	1282				.jpeg	28.39	Site visit; processed
09-05-2020	Saturday	GC	02:17:00 PM	02:22:00 PM	5m	108						Stitching failed; not processed
11-05-2020	Monday	GB				33				.jpeg	1.01	Site visit
11-05-2020	Monday	GB	06:10:03 PM	06:54:23 PM	44m 20s	1404	Granville		11052020_Granville_Bridge	.tif	0.5042	Processed
11-05-2020	Monday	IMMB; Spans 0-2	07:44:12 PM	08:11:33 PM	27m 21s	897	11052020		SNB_11052020	.tif	0.2697	Not processed
13-05-2020	Wednesday	IMMB; Spans 0-2	05:31:46 PM	06:11:31 PM	39m 45s	822	13052020_SNB		SNB_13052020_at_50	.tif	0.2634	Not processed
19-05-2020	Tuesday	IMMB; VC	11:59:53 AM	12:03:35 PM	3m 42s	72	19052020_SNB_VC		SNB_VC_19052020	.tif	0.94	Not processed
23-05-2020	Saturday	GC				861				.arw	30.01	Site visit; stitching failed; not processed
26-05-2020	Tuesday	IMMB	05:06:00 PM	07:12:00 PM	2hr 6m	1286				.jpeg	42.52	Stitching failed; not processed
27-05-2020	Wednesday	IMMB; VC	12:50:56 PM	12:54:38 PM	3m 42s	72	27052020					Stitching failed; not processed
27-05-2020	Wednesday	IMMB; Spans 0-2	06:21:51 PM	07:25:00 PM	1hr 3m 9s	465	SNB_27052020		SNB_27052020_63216x22164	.tif	1.25	Not processed
02-06-2020	Tuesday	IMMB; Span 2	08:15:07 AM	08:49:20 AM	34m 13s	495	02062020_SNB		SNB_02062020_93696x46468	.raw	13.06	Stitching failed; not processed
03-06-2020	Wednesday	IMMB; Span 2	05:48:40 PM	06:03:09 PM	14m 29s	231	03062020_SNB_3		03062020_SNB_70708x33632	.raw	7.13	Processed
03-06-2020	Wednesday	IMMB; Span 3	06:40:30 PM	07:01:39 PM	21m 9s	330	03062020_SNB_4_PC		SNB_PC_1_03062020_217912x14136	.raw	9.24	Processed
04-06-2020	Thursday	GC	11:06:30 AM	11:14:48 AM	8m 18s	135	04062020_GC		GC_04062020_96420x15560	.raw	4.5	Not processed
04-06-2020	Thursday	GC	11:36:08 AM	11:44:28 AM	8m 20s	135	04062020_GC_1		GC_1_04062020_96248x15704	.raw	4.53	Not processed
05-06-2020	Friday	IMMB; Span 2	06:28:26 PM	06:45:20 PM	16m 54s	231		05062020_SNB	SNB_05062020_78752x35008	.raw	8.27	Processed
05-06-2020	Friday	IMMB; Span 3	06:01:36 PM	06:22:45 PM	21m 9s	330	05062020_SNB_PC_2		SNB_PC_2_05062020_88412x15884	.raw	4.21	Processed
06-06-2020	Saturday	IMMB; Span 2	06:05:17 PM	06:23:07 PM	17m 50s	264		06062020_SNB	SNB_06062020	.tif	10.9	Not processed
08-06-2020	Monday	IMMB; VC	01:11:19 PM	01:15:53 PM	5m 34s	72	08062020_SNB_VC_1		SNB_VC_1_08062020_87948x9928	.raw	2.62	Not processed
08-06-2020	Monday	IMMB; Span 2	06:10:43 PM	06:25:52 PM	15m 9s	231	08062020_SNB		SNB_08062020_74576x33620	.raw	7.52	Processed
08-06-2020	Monday	IMMB; Span 3	05:46:28 PM	06:08:04 PM	21m 36s	192	08062020_SNB_PC_3		SNB_PC_3_08062020_97692x15344	.raw	4.5	Processed
10-06-2020	Wednesday	IMMB; Span 2	06:32:25 PM	06:52:12 PM	19m 47s	231	10062020_SNB		10062020_SNB_78272x33708	.raw	7.92	Processed
10-06-2020	Wednesday	IMMB; Span 3	07:03:04 PM	07:23:57 PM	20m 53s	330	10062020_SNB_PC_4		SNB_PC_4_10062020_92736x14468	.raw	4.03	Processed
12-06-2020	Friday	IMMB; Span 2	06:07:00 PM	06:25:00 PM	18m	264		12062020_SNB	SNB_12062020	.tif	11.92	Not processed
12-06-2020	Friday	IMMB; Span 3	05:44:25 PM	06:05:26 PM	21m 1s	330	12062020_SNB_PC_5		SNB_PC_5_12062020_112132x15164	.raw	5.1	Processed
13-06-2020	Saturday	GB	07:18:00 PM	07:58:00 PM	40m	22				.jpeg	0.95	Site visit
15-06-2020	Monday	IMMB; Span 2	05:53:00 PM	06:10:00 PM	17m	231		15062020_SNB	SNB_15062020	.tif	11.17	Not processed
15-06-2020	Monday	IMMB; Span 3	06:14:19 PM	06:35:11 PM	20m 52s	330	15062020_SNB_PC_6		SNB_PC_6_15062020_93352x14804	.raw	4.15	Processed
17-06-2020	Wednesday	IMMB; Span 2	06:05:07 PM	06:23:25 PM	18m 18s	264	17062020_SNB		SNB_17062020_71280x35076	.raw	7.5	Processed
17-06-2020	Wednesday	IMMB; Span 3	05:34:53 PM	06:00:59 PM	26m 6s	396	17062020_SNB_PC_7		SNB_PC_7_17062020_97236x17888	.raw	5.22	Processed
19-06-2020	Friday	IMMB; Span 2	04:24:13 PM	04:40:50 PM	16m 37s	264	19062020_SNB		SNB_19062020_70924x35524	.raw	7.56	Processed
19-06-2020	Friday	IMMB; Span 3	04:44:46 PM	05:06:44 PM	21m 58s	345	19062020_SNB_PC_8		SNB_PC_8_19062020_90636x15960	.raw	4.34	Processed
22-06-2020	Monday	IMMB; Span 2	06:01:31 PM	06:27:44 PM	21m 54s	264	22062020_SNB		SNB_22062020_70688x35540	.raw	7.54	Processed
22-06-2020	Monday	IMMB; Span 3	06:29:27 PM	06:51:56 PM	22m 29s	345	22062020_SNB_PC_9		SNB_PC_9_22062020_100164x15928	.raw	4.79	Processed
22-06-2020	Monday	IMMB	07:53:00 PM	08:09:00 PM	16m	16				.jpeg	0.59	Site visit
24-06-2020	Wednesday	IMMB; Span 2	06:15:50 PM	06:32:27 PM	16m 37s	264	24062020_SNB		SNB_24062020_70756x35604	.raw	7.56	Processed
24-06-2020	Wednesday	IMMB; Span 3	05:51:56 PM	06:14:05 PM	22m 9s	345	24062020_SNB_PC_10		SNB_PC_10_24062020_107180x15820	.raw	5.09	Processed
26-06-2020	Friday	IMMB; Span 2	06:14:03 PM	06:30:38 PM	16m 35s	264	26062020_SNB		SNB_26062020_71316x34752	.raw	7.44	Processed
26-06-2020	Friday	IMMB; Span 3	06:32:47 PM	06:56:10 PM	23m 23s	345	26062020_SNB_PC_11		SNB_PC_11_26062020_99816x15776	.raw	4.72	Processed
26-06-2020	Friday	IMMB; Span 0; Span 1	05:16:46 PM	05:27:26 PM	10m 40s	165	GigaPan_02_26062020		GigaPan_02_26062020_75192x23660	.raw	5.34	Not processed
26-06-2020	Friday	IMMB; Span 2	05:31:00 PM	05:40:00 AM	9m	132		GigaPan_03_26062020_PTGui	GigaPan_03_26062020_PTGuiPro	.tif	7.06	Not processed
29-06-2020	Monday	IMMB; Span 2	05:57:43 PM	06:15:19 PM	17m 36s	264	29062020_SNB		SNB_29062020_70628x35404	.raw	7.5	Processed
29-06-2020	Monday	IMMB; Span 3	05:25:34 PM	05:47:32 PM	22m 58s	345	29062020_SNB_PC_12		SNB_PC_12_29062020_88256x15768	.raw	4.17	Processed
01-07-2020	Wednesday	IMMB; Span 2	07:09:00 PM	07:28:00 PM	19m	264		01072020_SNB	SNB_01072020	.psb	7.8	Not processed
01-07-2020	Wednesday	IMMB; Span 3	07:30:29 PM	07:52:27 PM	21m 58s	345	01072020_SNB_PC_13		SNB_PC_13_01072020_98268x15856	.raw	4.67	Processed
03-07-2020	Friday	IMMB; Span 2	02:41:38 PM	02:58:13 PM	16m 35s	264	03072020_SNB		SNB_03072020_71596x34264	.raw	7.36	Processed
03-07-2020	Friday	IMMB; Span 3	02:59:59 PM	03:22:55 PM	22m 56s	345	03072020_SNB_PC_14		SNB_PC_14_03072020_93176x15776	.raw	4.41	Processed
03-07-2020	Friday	IMMB; Spans 0-4	01:20:07 PM	02:02:05 PM	41m 58s	600		03072020_SNB_Full	03072020_SNB_Full	.psb	1.1	Not processed
06-07-2020	Monday	IMMB; Span 2	05:26:35 PM	05:43:36 PM	17m 1s	264	06072020_SNB		SNB_06072020_71124x35632	.raw	7.6	Not processed
06-07-2020	Monday	IMMB; Span 3	05:02:22 PM	05:24:55 PM	22m 33s	345	06072020_SNB_PC_15		SNB_PC_15_06072020_90336x15884	.raw	4.3	Processed
07-07-2020	Tuesday	IMMB	04:34:00 PM	05:00:00 PM	26m	85				.jpeg	2.39	Site visit
08-07-2020	Wednesday	IMMB; Span 2	04:41:04 PM	05:00:51 PM	19m 47s	264	08072020_SNB		SNB_08072020_71120x34960	.raw	7.46	Processed
08-07-2020	Wednesday	IMMB; Span 3	04:16:55 PM	04:39:09 PM	22m 14s	345	08072020_SNB_PC_16		SNB_PC_16_08072020_88672x15768	.raw	4.19	Processed
10-07-2020	Friday	IMMB; Span 2	04:01:48 PM	04:18:41 PM	16m 53s	264	10072020_SNB		SNB_10072020_70300x35220	.raw	7.43	Not processed
10-07-2020	Friday	IMMB; Span 3	04:20:12 PM	04:43:19 PM	23m 7s	345	10072020_SNB_PC_17		SNB_PC_17_10072020_87616x15808	.raw	4.16	Processed
10-07-2020	Friday	IMMB; Span 1	04:45:38 PM	04:56:30 PM	10m 52s	168	10072020_SNB_First_Section		SNB_First_Section_10072020_43432x32252	.raw	4.2	Processed
10-07-2020	Friday	IMMB; Span 4	05:04:32 PM	05:18:36 PM	14m 4s	225	10072020_SNB_Last_Two_Sections		SNB_Last_Two_Sections_10072020_75904x12	.raw	2.93	Processed
13-07-2020	Monday	IMMB; Span 2	03:35:08 PM	03:51:45 PM	16m 37s	264	13072020_SNB		SNB_13072020_71952x35628	.raw	7.69	Not processed
13-07-2020	Monday	IMMB; Span 3	03:53:04 PM	04:15:17 PM	22m 13s	345	13072020_SNB_PC_18		SNB_PC_18_13072020_91740x15780	.raw	4.34	Processed
15-07-2020	Wednesday	IMMB; Span 2	03:52:00 PM	04:08:37 PM	16m 37s	264	15072020_SNB		SNB_15072020_70600x35352	.raw	7.49	Processed
15-07-2020	Wednesday	IMMB; Span 3	04:10:42 PM	04:32:40 PM	21m 58s	345	15072020_SNB_PC_19		SNB_PC_19_15072020_91096x16356	.raw	4.47	Processed
17-07-2020	Friday	IMMB; Span 2	02:57:59 PM	03:15:00 PM	17m 1s	264	17072020_SNB		SNB_17072020_71076x34948	.raw	7.45	Not processed
17-07-2020	Friday	IMMB; Span 3	03:46:39 PM	04:09:58 PM	23m 19s	345	17072020_SNB_PC_20		SNB_PC_20_17072020_89600x15812	.raw	4.25	Processed
18-07-2020	Saturday	GC	04:00:00 PM	07:06:00 PM	3hr 6m	215				.jpeg	9.21	Site visit
20-07-2020	Monday	IMMB; Span 2	03:20:11 PM	03:36:55 PM	16m 44s	264	20072020_SNB		SNB_20072020_71340x35492	.raw	7.6	Not processed
20-07-2020	Monday	IMMB; Span 3	03:42:02 PM	04:03:59 PM	21m 57s	345	20072020_SNB_PC_21		SNB_PC_21_20072020_92948x15628	.raw	4.36	Processed
22-07-2020	Wednesday	IMMB; Span 2	03:16:03 PM	03:33:08 PM	17m 5s	264	22072020_SNB		SNB_22072020_71324x35228	.raw	7.54	Processed
22-07-2020	Wednesday	IMMB; Span 3	03:34:26 PM	03:56:51 PM	22m 25s	345	22072020_SNB_PC_22		SNB_PC_22_22072020_92356x16080	.raw	4.46	Processed
24-07-2020	Friday	IMMB; Span 2	03:56:49 PM	04:13:34 PM	16m 45s	264	24072020_SNB		SNB_24072020_71012x35616	.raw	7.59	Not processed
24-07-2020	Friday	IMMB; Span 3	04:14:00 PM	04:36:42 PM	22m 42s	345	24072020_SNB_PC_23		SNB_PC_23_24072020_92748x15560	.raw	4.33	Processed
27-07-2020	Monday	IMMB; Span 2	02:47:49 PM	03:04:25 PM	16m 36s	264	27072020_SNB		SNB_27072020_70592x34352	.raw	7.27	Not processed
27-07-2020	Monday	IMMB; Span 3	03:05:46 PM	03:27:44 PM	21m 58s	345	27072020_SNB_PC_24		SNB_PC_24_27072020_92900x16056	.raw	4.47	Processed
29-07-2020	Wednesday	IMMB; Span 2	02:22:06 PM	02:38:52 PM	16m 46s	264	29072020_SNB		SNB_29072020_71008x34844	.raw	7.42	Processed
29-07-2020	Wednesday	IMMB; Span 3	02:40:10 PM	03:02:08 PM	21m 58s	345	29072020_SNB_PC_25		SNB_PC_25_29072020_91476x15772	.raw	4.33	Processed
31-07-2020	Friday	IMMB; Span 2	11:55:00 AM	12:12:00 PM	17m	264		31072020_SNB_PTGui_Pro	31072020_SNB_PTGui_Pro	.psb	5.48	Not processed
31-07-2020	Friday	IMMB; Span 3	12:13:57 PM	12:35:54 PM	21m 57s	345	31072020_SNB_PC_26		SNB_PC_26_31072020_89224x15684	.raw	4.2	Processed
03-08-2020	Monday	IMMB; Span 2	03:16:31 PM	03:33:34 PM	17m 3s	264	03082020_SNB		SNB_03082020_70964x35376	.raw	7.53	Processed
03-08-2020	Monday	IMMB; Span 3	03:34:53 PM	03:56:51 PM	21m 58s	345	03082020_SNB_PC_27		SNB_PC_27_03082020_90672x15840	.raw	4.31	Processed
05-08-2020	Wednesday	IMMB; Span 2	03:49:45 PM	04:06:31 PM	16m 46s	264	05082020_SNB		SNB_05082020_71192x35504	.raw	7.58	Not processed
05-08-2020	Wednesday	IMMB; Span 3	04:07:42 PM	04:29:40 PM	21m 58s	345	05082020_SNB_PC_28		SNB_PC_28_05082020_97644x15768	.raw	4.62	Processed
07-08-2020	Friday	IMMB; Span 2	04:08:00 PM	04:24:00 PM	16m	264		07082020_SNB	SNB_07082020_PTGuiPro	.psb	7.68	Not processed
07-08-2020	Friday	IMMB; Span 3	04:26:33 PM	04:49:50 PM	23m 17s	345	07082020_SNB_PC_29		SNB_PC_29_07082020_90272x15828	.raw	4.29	Processed
10-08-2020	Monday	IMMB; Span 2	04:16:19 PM	04:33:45 PM	17m 26s	264	10082020_SNB		SNB_10082020_70892x34964	.raw	7.44	Processed
10-08-2020	Monday	IMMB; Span 3	04:35:08 PM	04:57:06 PM	21m 58s	345	10082020_SNB_PC_30		SNB_PC_30_10082020_86756x15896	.raw	4.14	Processed
12-08-2020	Wednesday	IMMB; Span 2	03:46:25 PM	04:03:14 PM	16m 49s	264	12082020_SNB		SNB_12082020_71024x35444	.raw	7.55	Not processed
12-08-2020	Wednesday	IMMB; Span 3	04:04:31 PM	04:26:29 PM	21m 58s	345	12082020_SNB_PC_31		SNB_PC_31_12082020_86740x15792	.raw	4.11	Processed
14-08-2020	Friday	IMMB; Span 2	03:23:50 PM	03:42:58 PM	19m 8s	264	14082020_SNB		SNB_14082020_70808x35348	.raw	7.51	Not processed
14-08-2020	Friday	IMMB; Span 3	03:48:14 PM	04:10:56 PM	22m 42s	345	14082020_SNB_PC_32		SNB_PC_32_14082020_87252x15852	.raw	4.15	Processed
17-08-2020	Monday	IMMB; Span 2	04:09:38 PM	04:28:31 PM	18m 53s	264	17082020_SNB		SNB_17082020_70796x35812	.raw	7.61	Processed
17-08-2020	Monday	IMMB; Span 3	04:31:04 PM	04:53:02 PM	21m 58s	345	17082020_SNB_PC_33		SNB_PC_33_17082020_86100x15796	.raw	4.08	Processed
19-08-2020	Wednesday	IMMB; Span 2	04:02:00 PM	04:19:00 PM	17m	264		19082020_SNB	SNB_19082020_75481x36574	.psb	5.55	Not processed
19-08-2020	Wednesday	IMMB; Span 3	04:23:44 PM	04:46:37 PM	22m 53s	345	19082020_SNB_PC_34		SNB_PC_34_19082020_87092x15820	.raw	4.13	Processed
21-08-2020	Friday	IMMB; Span 2	02:30:00 PM	02:50:00 PM	20m	264		21082020_SNB	SNB_21082020_75195x37940	.psb	4.71	Not processed
21-08-2020	Friday	IMMB; Span 3	02:51:29 PM	03:13:27 PM	21m 58s	345	21082020_SNB_PC_35		SNB_PC_35_21082020_89484x16076	.raw	4.32	Processed
24-08-2020	Monday	IMMB; Span 2	01:47:42 PM	02:08:14 PM	20m 32s	264	24082020_SNB		SNB_24082020_70912x35508	.raw	7.55	Processed
24-08-2020	Monday	IMMB; Span 3	02:11:51 PM	02:34:19 PM	22m 28s	345	24082020_SNB_PC_36		SNB_PC_36_24082020_101060x15628	.raw	4.74	Processed
26-08-2020	Wednesday	IMMB; Span 2	02:46:12 PM	03:03:26 PM	17m 14s	264	26082020_SNB		SNB_26082020_70872x35528	.raw	7.55	Not processed
26-08-2020	Wednesday	IMMB; Span 3	03:04:57 PM	03:27:12 PM	22m 15s	345	26082020_SNB_PC_37		SNB_PC_37_26082020_86220x15804	.raw	4.09	Processed
28-08-2020	Friday	IMMB; Span 2	03:16:46 PM	03:35:28 PM	18m 42s	264	28082020_SNB		SNB_28082020_70868x35640	.raw	7.58	Processed
28-08-2020	Friday	IMMB; Span 3	03:37:38 PM	03:59:36 PM	21m 58s	345	28082020_SNB_PC_38		SNB_PC_38_28082020_93352x15744	.raw	4.41	Processed
31-08-2020	Monday	IMMB; Span 2	03:47:00 PM	04:08:00 PM	21m	264		31082020_SNB	SNB_31082020_79729x36824	.psb	5.46	Not processed
31-08-2020	Monday	IMMB; Span 3	04:17:41 PM	04:39:40 PM	21m 59s	345	31082020_SNB_PC_39		SNB_PC_39_31082020_101648x15768	.raw	4.81	Processed
31-08-2020	Monday	IMMB	04:41:00 PM	04:59:00 PM	18m	33				.jpeg	1.27	Site visit
02-09-2020	Wednesday	IMMB; Span 2	12:43:11 PM	01:02:37 PM	19m 26s	264		02092020_SNB	SNB_02092020_74872x36676	.tif	10.79	Processed
02-09-2020	Wednesday	IMMB; Span 3	01:04:49 PM	01:31:51 PM	27m 2s	345	02092020_SNB_PC_40		SNB_PC_40_02092020	.tif	1.03	Processed
04-09-2020	Friday	IMMB; Span 2	01:08:35 PM	01:26:40 PM	18m 5s	264	04092020_SNB		SNB_04092020	.tif	1.87	Not processed
04-09-2020	Friday	IMMB; Span 3	01:29:09 PM	01:51:56 PM	22m 47s	345	04092020_SNB_PC_41		SNB_PC_41_04092020	.tif	1.13	Processed
07-09-2020	Monday											Labor Day
09-09-2020	Wednesday	IMMB; Span 2	02:00:38 PM	02:17:29 PM	16m 51s	264	09092020_SNB		SNB_09092020	.tif	1.91	Processed
09-09-2020	Wednesday	IMMB; Span 3	02:20:25 PM	02:43:15 PM	22m 50s	345	09092020_SNB_PC_42		SNB_PC_42_09092020	.tif	1.26	Processed
11-09-2020	Friday	IMMB; Span 2	02:05:06 PM	02:28:01 PM	22m 55s	264	11092020_SNB		SNB_11092020	.tif	1.34	Not processed
11-09-2020	Friday	IMMB; Span 3	02:31:21 PM	02:53:19 PM	21m 58s	345	11092020_SNB_PC_43		SNB_PC_43_11092020	.tif	1.59	Processed
14-09-2020	Monday											Course field-school
16-09-2020	Wednesday	IMMB; Span 2	01:35:00 PM	01:52:00 PM	17m	264		16092020_SNB	SNB_16092020	.tif	10.91	Not processed
16-09-2020	Wednesday	IMMB; Span 3	01:54:17 PM	02:16:15 PM	21m 58s	345	16092020_SNB_PC_44		SNB_PC_44_16092020	.tif	1.25	Processed
18-09-2020	Friday	IMMB; Span 2	04:17:32 PM	04:39:37 PM	22m 5s	264	18092020_SNB		SNB_18092020	.tif	2.39	Processed
21-09-2020	Monday											Course field-school (Mission, B.C.)
23-09-2020	Wednesday											Classes
25-09-2020	Friday	IMMB; Span 2	02:17:53 PM	02:36:13 PM	18m 20s	264	25092020_SNB		SNB_25092020	.tif	2.3	Processed
25-09-2020	Friday	IMMB	02:39:00 PM	03:14:00 PM	35m	48				.jpeg	1.8	Site visit
28-09-2020	Monday											Course field-school
30-09-2020	Wednesday											Classes
02-10-2020	Friday	IMMB; Span 2	12:44:25 PM	13:03:11 PM	18m 46s	264	01102020_SNB		SNB_02102020	.tif	2.2	Processed
03-10-2020	Saturday	GC	12:45:00 PM	2:45:00 PM	2hr	1371				.arw	109.73	Site visit; Processed
07-10-2020	Wednesday	GB	4:27:00 PM	5:12:00 PM	45m	82				.jpeg	2.99	Site visit
22-12-2020	Tuesday	IMMB; Span 2	03:40:00 PM	04:51:00 PM	1hr 11m	16	22122020_SNB		SNB_22122020_35352x12332	.tif	0.9917	Site visit; Processed
05-03-2021	Friday	IMMB; Span 2	04:35:57 PM	04:36:35 PM	38s	18	05032021_SNB		SNB_03052021_35600x12456	.tif	0.256	Site visit; Processed
05-03-2021	Friday	IMMB	04:37:05 PM	04:37:25 PM	20s	11	05032021_SNB_Scaffolds		SNB_Scaffolds_05032021_32012x13692	.tif	0.425	Site visit; Processed
Total						39494					810.3987	
Span 3						15003					182.96	
Span 2						12277					331.5677	

Appendix L.

Sampling at Viterra Cascadia Grain Terminal.

One GigaPan EPIC Pro was scheduled to be deployed at Viterra Cascadia Terminal, thus a weather-proofed enclosure was required to house the GigaPan EPIC Pro and Sony systems so they were able to operate remotely in the field. SRH Contracting designed and built the GigaPan EPIC Pro housing (Figure L-1 and Figure L-2) with ½ inch exterior grade plywood. The interior of the housing was sealed with water-based varnish while the exterior was weather-proofed with white semi-gloss paint to reduce solar gain and increase insulation. The roof was also insulated with Styrofoam, and extended with overhangs to protect the curved 3-mm Lexan polycarbonate optical window. With a Noctua 120mm cooling fan installed and powered by a 120V AC or 6V DC power supply, it allowed for better air circulation. The temperature was regulated by a TempStar STC 1000 digital programmable thermostat. To allow for more air intake, one side of the housing had an exhaust vent under the roof peak that was protected with fine mesh to prevent insect entry. The GigaPan EPIC Pro robotic system was mounted on Andoer DY-60N tripod levelling base and adjusting plate attached with Arca-Swiss square quick release where the whole system was powered by a 120V or USB 2.0A dual outlet power bar.

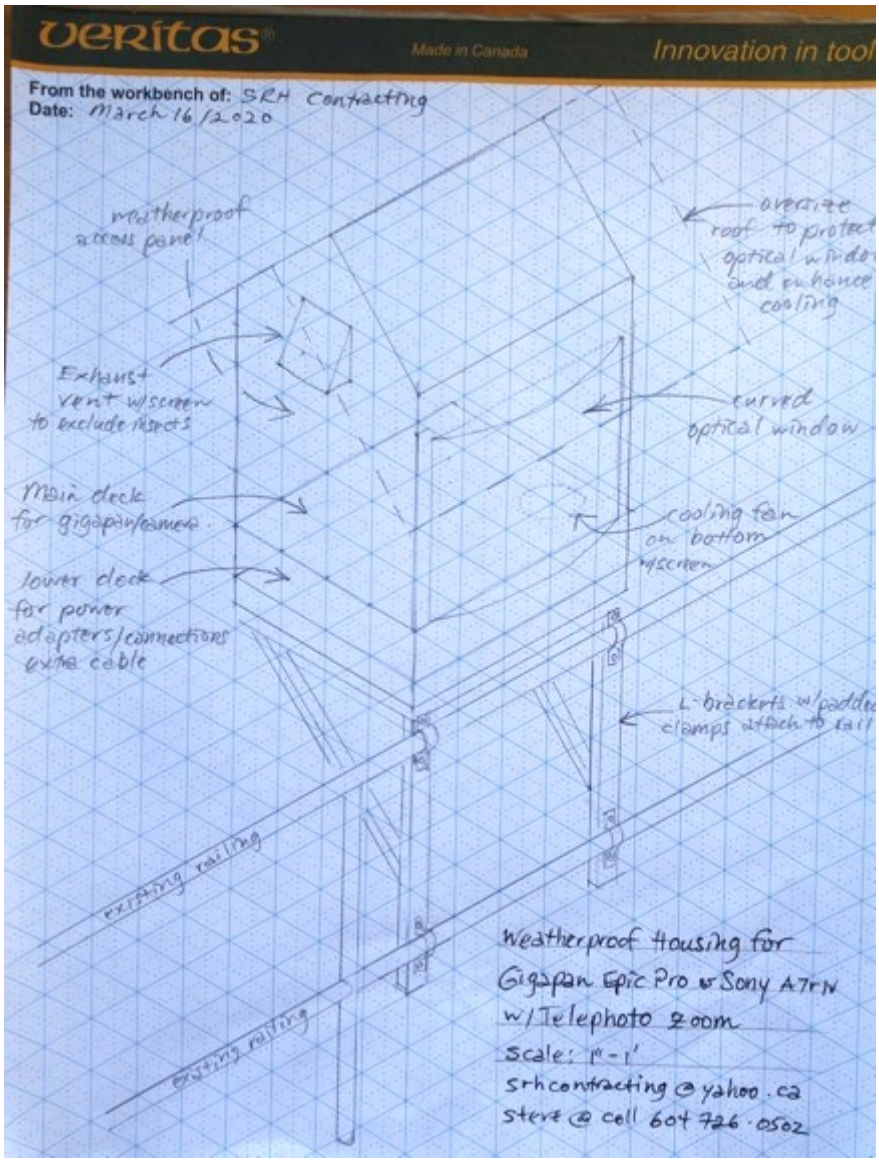


Figure L-1. Sketch drawing of the GigaPan EPIC Pro and Sony systems' weather-proof housing for sampling at Viterra Cascadia Terminal in Vancouver, British Columbia, in 2020.

Note: Photograph by Steve Haavik, 2020.

Figure L-2. Custom-made GigaPan EPIC Pro and Sony camera weather-proof enclosure.

The GigaPan EPIC Pro and Sony camera weather-proof enclosure was mounted and fastened securely on railings with four long thin screws, while the power was supplied by a wall outlet (Figure L-3).

Figure L-3. GigaPan EPIC Pro and Sony camera enclosure on Viterra Cascadia Terminal in Vancouver, British Columbia.

The GigaPan robotic system was set to 3.4 vertical degrees, and took images in 8 columns × 3 rows order, recording 72 images in each sampling. Sony camera settings were manually adjusted to compensate different weather conditions, and began a four-minute image recording at 12 p.m. on May 19, 2020. The settings were: 200 mm focal length, aperture at F8, three bracketed images at 1/500s, ISO 200 with spot metering exposure and automatic white balance. The focusing was set to automatic with DMF. Because the systems were synchronized to perform a 23h 59m interval time-lapse photography, the image resolution was down-scaled to large FINE JPEG at 60 MP to maximize storage efficiency. This system was scheduled to record time-lapse images at 24 h interval with the interval time elapsing from each subsequent sampling. Images taken were studied for cormorant population count, especially to understand the nesting activities that occurred on the other side of the Ironworkers Memorial Bridge that were unable to be captured from the sample location outside Squamish Nation Reserve.

Time-lapse image recording at Viterra Cascadia Terminal was halted three weeks into the first sampling due to equipment failure. GigaPan EPIC Pro failed to take continuous time-lapse images that were scheduled at 24 h interval. First, due to heavy machinery the terminal was prone to vibration, image results were blurry (Figure 4-9) although the second highest shutter at 1/4000 (or 0.00025 second) was used. Images

are therefore not accurate in tabulating population and nest counts. Results demonstrate that GigaPan robotic and Sony systems are not as effective as the sampling that occurred outside Squamish Nation Reserve.

Figure L-4. Blurry image does not provide accurate cormorant population and nest counts on the Ironworkers Memorial Bridge, suggesting GigaPan robotic and Sony camera systems are not effective on this sample location.

Sampling was consequently concluded on June 8, 2020. I believe that terminal vibrations from heavy machinery used to process grain could not be compensated with the Sony in-body 5-axis image stabilization and high shutter speeds. As well, apart from equipment failure, sampling at Viterra Cascadia Terminal was carried out over a short time span due to accessibility concerns that pertained to the WorkSafeBC COVID-19 concerns.